Inspiring Greatness

ISD

INDEPENDENCE SCHOOL DISTRICT

Math Virtual Learning

Probability and Statistics

May 22, 2020

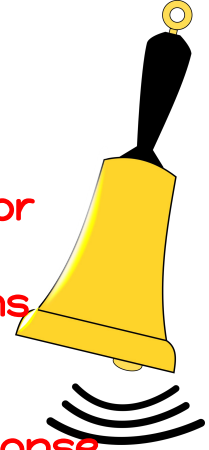
Probability and Statistics
Lesson: May 22, 2020

Objective/Learning Target:
Students will be able to articulate the statistical and probability occurrences in their real life surroundings.

Let's Get Started!

1. The graphs we studied are Circle, Stem and Leaf, Histogram, or Box and Whiskers
   a. Which one are you the best at?
   b. Which one do you feel you need to get better at?
2. Did you prefer to calculate Standard Deviation by hand (using the 6 steps) or using the Desmos calculator?
3. In order to use the Empirical Rule, your data must be _____?
4. Why do we need to use Z-Scores?
5. Does Central Limit Theorem use population or sample means?
6. What does it mean when they say a 95% Confidence Interval?
7. What are 2 common biases found in Survey Questions?
8. What is the difference between Probability vs Odds?
9. Instead of drawing a Tree Diagram you could use what Principle?
10. How do you know when a probability is Independent?
11. What is the difference between a Union and an Intersection Probability?
12. What is the difference between Combinations and Permutations?

1. Your opinion, answers vary
2. Your opinion, answers vary
3. In order to use the Empirical Rule, your data must be _NORMAL_?
4. Why do we need to use Z-Scores? To find the % of your data above, below, or between your data points.
5. Does Central Limit Theorem use population or sample means? Sample Means
6. What does it mean when they say a 95% Confidence Interval? You are 95% confident that the "true mean" is somewhere between your intervals.
7. What are 2 common biases found in Survey Questions? Respons/NonResponse, Sampling, Undercoverage
8. What is the difference between Probability vs Odds? P = what you want/total, O= what you want/what you don't want
9. Instead of drawing a Tree Diagram you could use what Principle? Fundament Counting Principle
10. How do you know when a probability is Independent? When the first event doesn't affect the 2nd event's outcome.
11. What is the difference between a Union and an Intersection Probability? Union= P(A ∪ B)=add, Intersection=P(A∩) = multiply
12. What is the difference between Combinations and Permutations? Combination=order doesn't matter, Permutation=order matters



Here's what we have covered this semester...

If you need to look back or review any of the topics in our Virtual Learning time this semester, just click on the link and it will take you directly to the lesson.

Circle Graphs	Standard Deviation	Empirical Rule	Z-Score Practice Above Below and Between	Confidence Intervals	Fundamental Counting Principle	Combinations and Permutations
Stem and Leaf	Standard Deviation with Technology	Empirical Rule Practice	Mean, St Dev, Z-Score from graphs Practice	Confidence Intervals Practice	Fundamental Counting Principle Practice	Combinations and Permutations Practice
Histogram	Is the Data Normal?	Z-Scores	Central Limit Theorem	Research and Survey Questions	Independent vs Dependent Probability	Probability Practice
Box and Whiskers	Is it Normal Practice	Z-Score to Percentage	Central Limit Theorem and Sample Means	Research Question Bias	Union and Intersections Probability	Probability Games
Graphing Review	Stand Dev, Normal, and Graphing Review	Percentage back to Z-Score and then Data Point	Z-Score vs Central Limit Theorem	Probability vs Odds	Union and Intersection Practice	Final Project Practice

One last Mega-Practice problem

Part 1: Make a chart showing all of the possible sums of rolling two dice.

	1	2	3	4	5	6
1						
2						
3						
4						
5						
6						

One last Mega-Practice problem

Part 1 ANSWER: Make a chart showing all of the possible sums of rolling two dice.

	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

One last Mega-Practice problem

Part 2: Find the given probabilities

- Probability of rolling a sum of 2 or 12
- Probability of rolling a 4 on the first die and a 2 on the second
- Probability of rolling a sum greater than 8
- Probability of rolling a 4 on the first die or a 2 on the second 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

One last Mega-Practice problem

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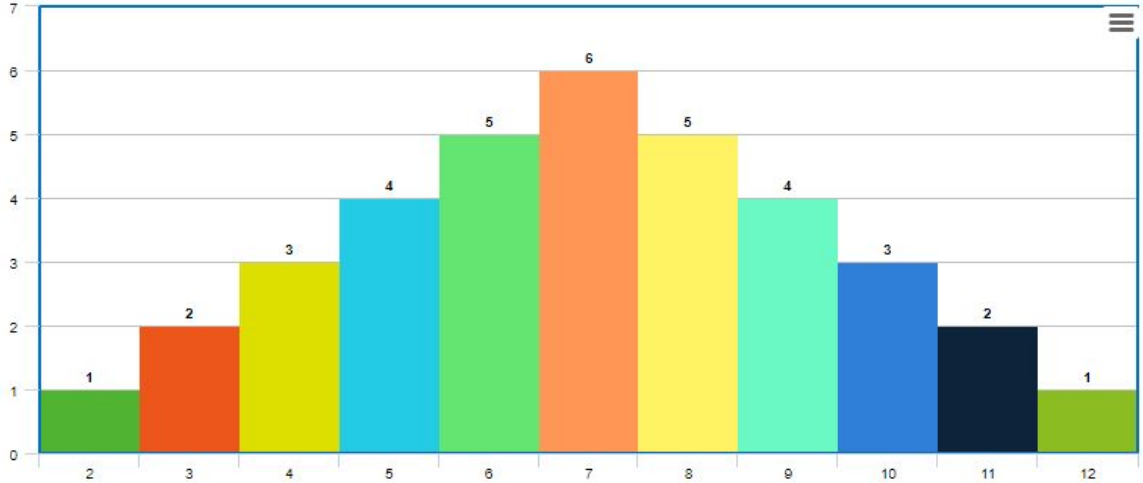
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	11
6	7	8	9	10	11	12

Part 2 ANSWER: Find the given probabilities

- Probability of rolling a sum of 2 or 12
  2/36 = 1/18
- Probability of rolling a 4 on the first die **and** a 2 on the second
  ⅙*⅙=1/36
- Probability of rolling a sum greater than 8
  P(9) = 4/36 P(10) = 3/36 P(11) = 2/36 P(12) = 1/36
  4/36+3/36+2/36+1/36 = 10/36 = 5/18
- Probability of rolling a 4 on the first die **or** a 2 on the second die
  ⅙ + ⅙ = 2/6 = ⅓

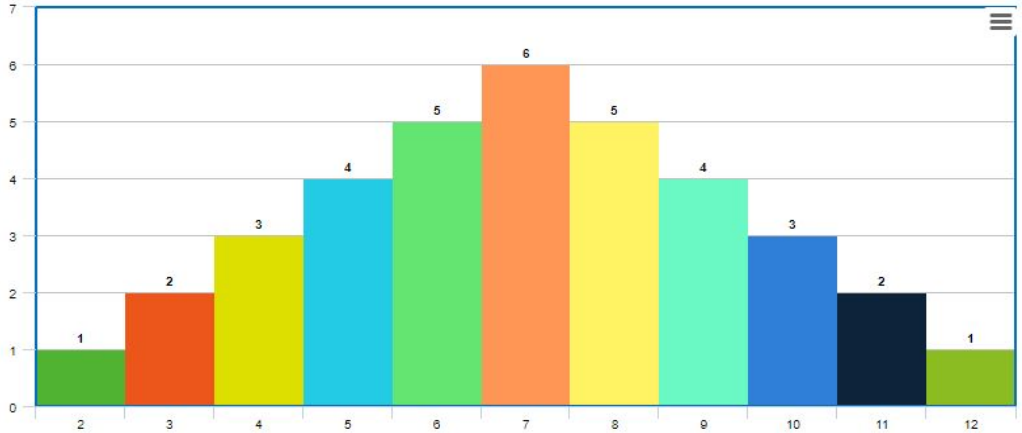
One last Mega-Practice problem



Part 3: Above a graph of the results of the sums possible from rolling two dice.

- What type of graph is drawn?
- What is the mean, median and mode?
- What is the standard deviation?
- Is the curve normal?

One last Mega-Practice problem



Part 3 ANSWER: Above a graph of the results of the sums possible from rolling two dice.

- What type of graph is drawn? HISTOGRAM
- What is the mean, median and mode? They are all 7
- What is the standard deviation? 2.45
- Is the data normal? NO! It looks normal, but if you calculate it, only 67% of the data is in the range and we need 68%. So it was close, but no!

One last Mega-Practice problem

Part 4: Our data was not normal. But let's assume we have a set of data that is normal with a mean of 7 and a standard deviation of 2.45.

What is the z-score for rolling an 11?

What percentage of the data falls between 5 & 9?

One last Mega-Practice problem

Part 4 Answer: Our data was not normal. But let's assume we have a set of data that is normal with a mean of 7 and a standard deviation of 2.45.

What is the z-score for rolling an 11?

11-7 = 4 4/2.45 = 1.63 z-score = 2.45

What percentage of the data falls between 5 & 9?

z-score of 9 = 0.82 = 79.39% z-score of 5 = -0.82 = 20.61%
Percentage of data between 5-9 = 58.78%

One last Mega-Practice problem

Part 5: Assume that a researcher was running an experiment that had individuals roll a pair of die 8 times and record the results of the sums. Would the following be good research questions? Why or why not?

Which of the following sums did you roll most?

A. 5
B. 6
C. 7
D. 8

How would you describe the challenge level of this experiment?

A. Extremely Difficult
B. Mildly Difficult
C. Neutral
D. Mildly Easy
E. Extremely Easy

If looking at the research experiment in its entirety, how would you rank the complexity of thought on a scale of 5 being extraordinarily advanced to a 1 of being limited in its estimation of difficulty?

One last Mega-Practice problem

Part 5 ANSWER: Assume that a researcher was running an experiment that had individuals roll a pair of die 8 times and record the results of the sums. Would the following be good research questions? Why or why not?

Which of the following sums did you roll most?

A. 5
B. 6
C. 7
D. 8

This question is flawed because it only gives 4 of the 11 possible options. While it is most likely that a person rolled a 5-8 most, it is not guaranteed. Experimental probabilities do not always follow theoretical results, especially if they only rolled 8 times. It is possible that the person rolled a 4 or 12 most often. If this happened, they would have no response option.

One last Mega-Practice problem

Part 5 ANSWER: Assume that a researcher was running an experiment that had individuals roll a pair of die 8 times and record the results of the sums. Would the following be good research questions? Why or why not?

How would you describe the challenge level of this experiment?

A. Extremely Difficult
B. Mildly Difficult
C. Neutral
D. Mildly Easy
E. Extremely Easy

This is a good question. It is important to know if your participants found it difficult which could mean that experiment has flaws. The question is worded simply and there is a balance in the response options.

One last Mega-Practice problem

Part 5 ANSWER: Assume that a researcher was running an experiment that had individuals roll a pair of die 8 times and record the results of the sums. Would the following be good research questions? Why or why not?

If looking at the research experiment in its entirety, how would you rank the complexity of thought on a scale of 5 being extraordinarily advanced to a 1 of being limited in its estimation of difficulty?

This question is flawed for many reasons. First, it is wordy. This could have been asked using a lot fewer words. Second, the vocabulary and sentence structure is hard to understand. Third, the response options are embedded in the question and hard to determine the real scale.

CONGRATULATIONS!!

You have completed Probability and Statistics!

Take a moment to look back at Slide 5 to see all of the amazing things you have learned. And that doesn't even include the stuff you learned while we were still in class.

GREAT JOB! You should be proud.