

# ACTIVE LEARNING AND STUDENT ENGAGEMENT IN THE STATISTICS CLASSROOM

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Is PLINKO a fair game?

*$X^2$  Goodness of Fit*



# STUDENTS PLAY PLINKO TO COLLECT OUTCOMES.

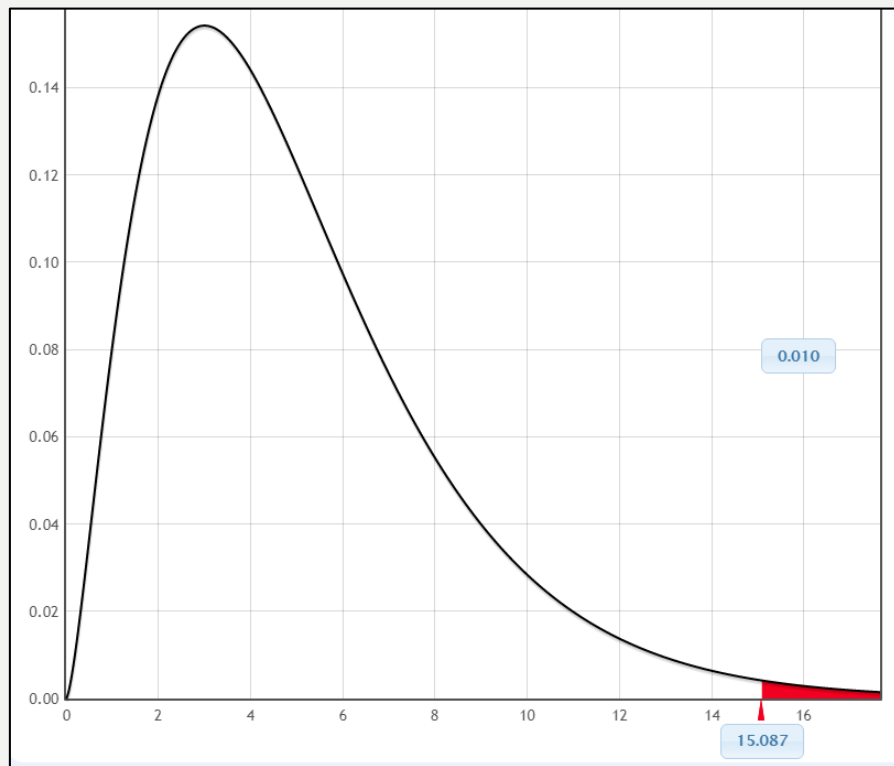
- <http://game-game.com/96015/> for free PLINKO game simulator
- Have the students decide how to play the game to meet the requirements of the Chi-Square GOF test.
- Have students play one game individually or a few rounds in small groups.
- Share the data with the class.

# RESULTS FROM THE SIMULATION.

<b>\$ Amount Won</b>	<b>Frequency (Observed count)</b>
<b>0</b>	
<b>100</b>	
<b>500</b>	
<b>1000</b>	
<b>10000</b>	

# DETERMINE IF PLINKO IS A FAIR GAME.

- Test at 1% level of significance.
- Test at 5% and 10% level of significance, does it change your result?



# OTHER ACTIVITIES USING PLINKO

## RESULTS:

Beginning of  
Semester

Data  
Collection

Displays of  
Data

Middle of  
Semester

Probability

Expected  
Value

End of Semester

Goodness of  
Fit Test

Test for  
Independence

# COKE VS. PEPSI



THE COLA WARS...





# FOUR STATISTICS CLASSES PARTICIPATED IN A BLIND TASTE TEST

Number in Class	Prefer Coke	Prefer Pepsi
Class A 32	15	17
Class B 24	10	14
Class C 27	12	15
Class D 25	12	13

# USE DESCRIPTIVE STATISTICS TO DISPLAY/ DESCRIBE THE DATA

- What type of chart/graph/numbers do you think display the data so that it is easy to understand and make comparisons?
- Compare your displays with at least one other group. What do you think was better or needs to be improved with both groups?  
Develop an improved display incorporating the best of both groups.

# HYPOTHESIS TESTING

- What type of hypothesis test would you use?
- Write the null and alternative hypotheses and perform the appropriate test.
- State a conclusion at the .05 level.
- State a conclusion at the .01 level
- Did you get the same conclusion?

# USING INFERENCE STATISTICS TO PREDICT PREFERENCES.

Find the 95% confidence interval using the data from class A.

Find the confidence interval using the totals.

Compare the two intervals.

Repeat using the 99% confidence interval. Compare the results.

# BINOMIAL

- Does this experiment meet the parameters of a binomial experiment?
- If I surveyed 108 people, what is the probability that at least 50 preferred Pepsi?
- What is the probability that exactly than 45 people prefer Pepsi?
- 45% of the population prefers Pepsi to Coke

# CHI SQUARE

- How can a Chi Square goodness of fit test be used to analyze this data set?
- What would the null and alternative hypothesis tests be?
- What are your results at the  $\alpha = .05$  level?
- Use your graphing calculator to look at your results.

# **ACTIVE LEARNING IN STATISTICS**

**BEGINNING ON DAY ONE**

WHEN THEY HAND OUT THE SYLLABUS ON THE FIRST DAY





# WHAT IS A STATISTICAL QUESTION?

A statistical question is one that can be answered by collecting data and where there will be variability in that data.

- How many days are in March?
- How old is your dog?
- On average, how old are the dogs that live on this street?
- What proportion of the students at your school like watermelon?
- Do you like watermelons?
- How many bricks are in this wall?
- What was the temperature at noon in Baltimore today?

# DATA SET ACTIVITY

- What questions do you think were asked in this survey?
- How do you think the data was gathered?
- Why do you think this data was collected?
- Are there any unusual pieces of information? What may be a reason for this?
- What population do you think the data came from?



# QUESTIONS??

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