Name Schlansky
Mr. Schlansky

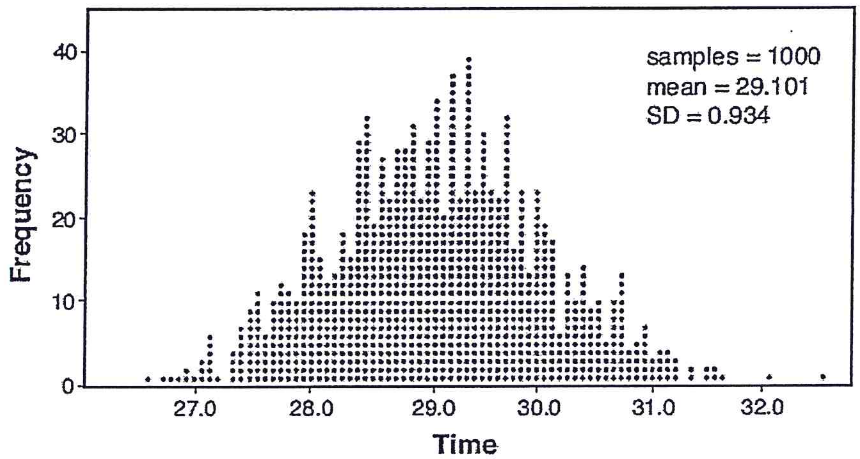
Date ______________
Algebra II

Sample Distributions Part III

1. A radio station claims to its advertisers that the mean number of minutes commuters listen to the station is 30. The station conducted a survey of 500 of their listeners who commute. The sample statistics are shown below.

$\bar{x}$	29.11
s_x	20.718

A simulation was run 1000 times based upon the results of the survey. The results of the simulation appear below.



Based on the simulation results, is the claim that commuters listen to the station on average 30 minutes plausible? Explain your response including an interval containing the middle 95% of the data, rounded to the *nearest hundredth.*

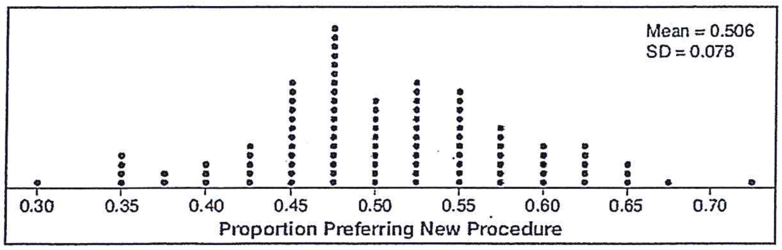
$CI = \bar{x} + 2S_x$

$= 29.101 + 2(.934) = 30.97$ $[27.23, 30.97]$

$= 29.101 - 2(.934) = 27.23$

Yes, 30 is inside the confidence interval.

2. Charlie's Automotive Dealership is considering implementing a new check-in procedure for customers who are bringing their vehicles for routine maintenance. The dealership will launch the procedure if 50% or more of the customers give the new procedure a favorable rating when compared to the current procedure. The dealership devises a simulation based on the minimal requirement that 50% of the customers prefer the new procedure. Each dot on the graph below represents the proportion of the customers who preferred the new check-in procedure, each of sample size 40, simulated 100 times.



Assume the set of data is approximately normal and the dealership wants to be 95% confident of its results. Determine an interval containing the plausible sample values for which the dealership will launch the new procedure. Round your answer to the *nearest hundredth.* Forty customers are selected randomly to undergo the new check-in procedure and the proportion of customers who prefer the new procedure is 32.5%. The dealership decides *not* to implement the new check-in procedure based on the results of the study. Use statistical evidence to explain this decision.

$CI = \bar{x} \pm 2S_x$

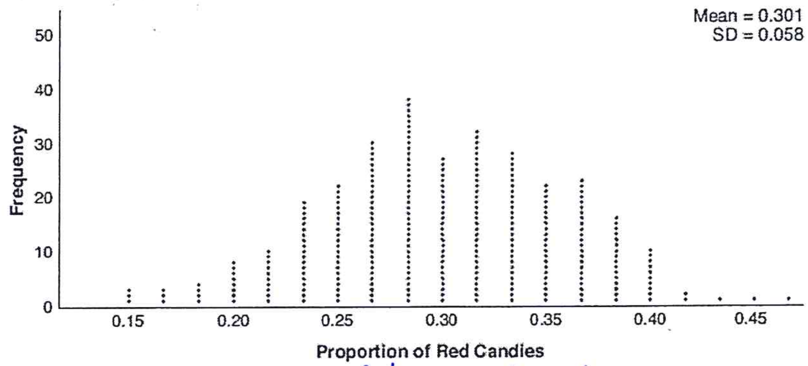
$= .506 + 2(.078) = .66$

$.506 - 2(.078) = .35$

$[.35, .66]$

.325 is not in the confidence interval.

3. Mary bought a pack of candy. The manufacturer claims that 30% of the candies manufactured are red. In her pack, 14 of the 60 candies are red. She ran a simulation of 300 samples, assuming the manufacturer is correct. The results are shown below.



confidence interval

Based on the simulation, determine the middle 95% of plausible values that the proportion of red candies in a pack is within. Based on the simulation, is it unusual that Mary's pack had 14 red candies out of a total of 60? Explain.

CI = mean ± 2(standard deviation)

CI = .301 ± 2(.058)

CI = .301 + 2(.058) = .417

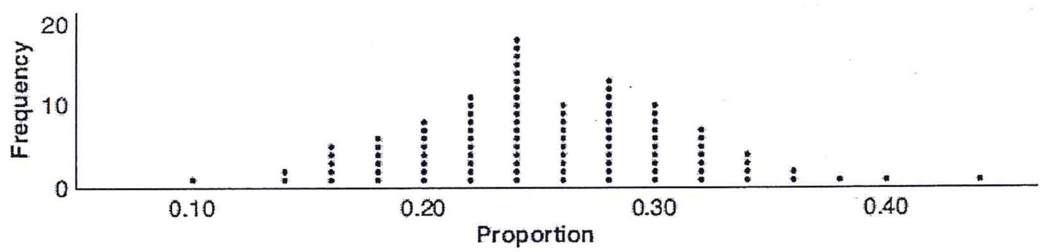
.301 − 2(.058) = .185

[.185, .417]

$\frac{14}{60} = .2\overline{3}$

No, it is usual because $.2\overline{3}$ is in the confidence interval.

4. A group of students was trying to determine the proportion of candies in a bag that are blue. The company claims that 24% of candies in bags are blue. A simulation was run 100 times with a sample size of 50, based on the premise that 24% of the candies are blue. The approximately normal results of the simulation are shown in the dot plot below.



The simulation results in a mean of 0.254 and a standard deviation of 0.060. Based on this simulation, what is a plausible interval containing the middle 95% of the data? A student found that 18 out of 50 of the candies were blue. Use statistical evidence to explain why this is an expected value.

CI = mean ± 2(standard deviation)

CI = .254 ± 2(.060)

.254 + 2(.060) = .374

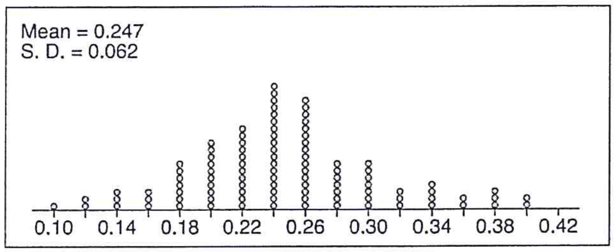
.254 − 2(.060) = .134

[.134, .374]

$\frac{18}{50} = .36$

.36 is inside the confidence interval.

5. Stephen's Beverage Company is considering whether to produce a new brand of cola. The company will launch the product if at least 25% of cola drinkers will buy the product. Fifty cola drinkers are randomly selected to take a blind taste-test of products *A*, *B*, and the new product. Nine out of fifty participants preferred Stephen's new cola to products *A* and *B*. The company then devised a simulation based on the requirement that 25% of cola drinkers will buy the product. Each dot in the graph shown below represents the proportion of people who preferred Stephen's new product, each of sample size 50, simulated 100 times.



Proportion Preferring Stephen's Product

Assume the set of data is approximately normal and the company wants to be 95% confident of its results. Does the sample proportion obtained from the blind taste-test, nine out of fifty, fall within the margin of error developed from the simulation? Justify your answer. The company decides to continue developing the product even though only nine out of fifty participants preferred its brand of cola in the taste-test. Describe how the simulation data could be used to support this decision.

$CI = \bar{x} + 2S_x$

$\frac{9}{50} = .18$

$CI = .247 + 2(.062) = .371$

$.247 - 2(.062) = .123$

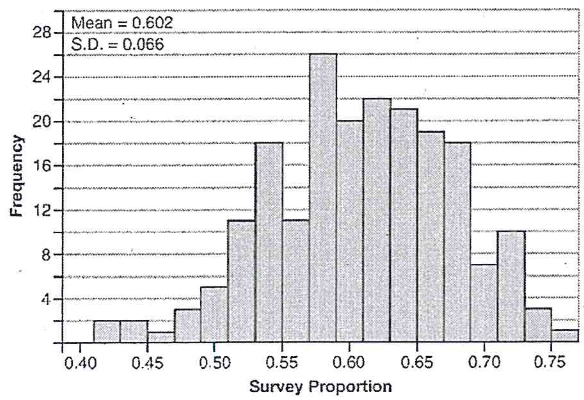
$[.123, .371]$

Yes, .18 is inside the confidence interval.

.25 is inside the confidence interval. It is an expected value

6. Fifty-five students attending the prom were randomly selected to participate in a survey about the music choice at the prom. Sixty percent responded that a DJ would be preferred over a band. Members of the prom committee thought that the vote would have 50% for the DJ and 50% for the band. A simulation was run 200 times, each of sample size 55, based on the premise that 60% of the students would prefer a DJ. The approximate normal simulation results are shown below.

Using the results of the simulation, determine a plausible interval containing the middle 95% of the data. Round all values to the *nearest hundredth*. Members of the prom committee are concerned that a vote of all students attending the prom may produce a 50%-50% split. Explain what statistical evidence supports this concern.



$CI = \bar{x} \pm 2S_x$

$= .602 + 2(.066) = .73$

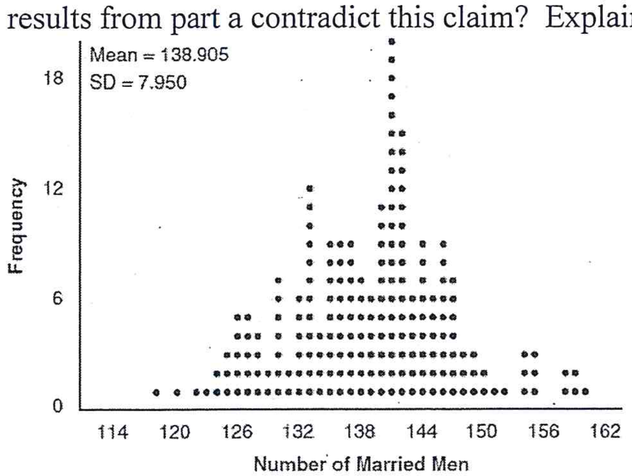
$= .602 - 2(.066) = .47$

$[.47, .73]$

• .5 is inside the confidence interval so 50% is an expected value

7. In a random sample of 250 men in the United States, age 21 or older, 139 are married. The graph below simulated samples of 250 men, 200 times, assuming that 139 of the men are married.

a) Based on the simulation, create an interval in which the middle 95% of the number of married men may fall. Round your answer to the *nearest integer*.
b) A study claims "50 percent of men 21 and older in the United States are married." Do your results from part a contradict this claim? Explain.



$CI = \bar{x} \pm 2S_x$

$= 138.905 + 2(7.950) = 155$

$= 138.905 - 2(7.950) = 123$

$[123, 155]$

50% of 250 = 125

No, 125 is inside the confidence interval so 50% is an expected value.

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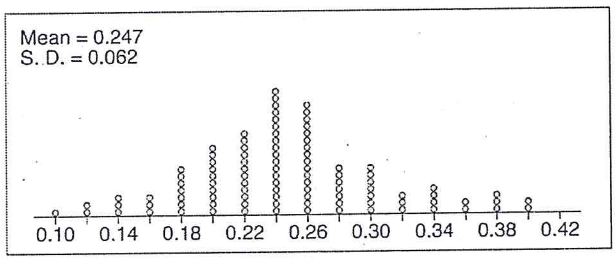

Proportion Preferring Stephen's Product

Assume the set of data is approximately normal and the company wants to be 95% confident of its results. Does the sample proportion obtained from the blind taste-test, nine out of fifty, fall within the margin of error developed from the simulation? Justify your answer. The company decides to continue developing the product even though only nine out of fifty participants preferred its brand of cola in the taste-test. Describe how the simulation data could be used to support this decision.

$CI = \bar{x} \pm 2S_x$

$CI = .247 + 2(.062) = .371$

$.247 - 2(.062) = .123$

$[.123, .371]$

$\frac{9}{50} = .18$

Yes, .18 is in the confidence interval.

.25 is inside the confidence interval. It is an expected value.