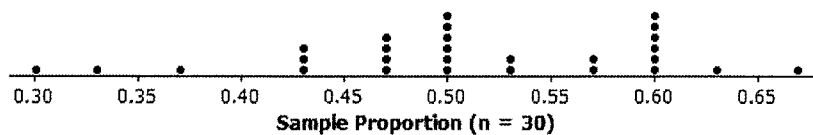


Name Schlansky
Mr. Schlansky

Date _____
Algebra II

Confidence Interval and Margin of Error

1. A group of eleventh graders wanted to estimate the population proportion of students in their high school who drink at least one soda per day. Each student selected a different random sample of 30 students and calculated the proportion that drink at least one soda per day. The dot plot below shows the sampling distribution. This distribution has a mean of 0.51 and a standard deviation of 0.09.



Find the margin of error and the confidence interval.

(.33, .69)

$$MOE = 2(50)$$

$$CI = \text{mean} \pm 2(SD)$$

$$MOE = 2(.09)$$

$$= .51 \pm 2(.09) = .69$$

$$MOE = .18$$

$$.51 - 2(.09) = .33$$

Is it reasonable to say that 40% of students drink at least one soda per day? Explain your answer.

Yes, .40 is inside the confidence interval

Is it reasonable to say that 80% of students drink at least one soda per day? Explain your answer.

No, .80 is not inside the confidence interval

2. A class of 28 eleventh graders wanted to estimate the proportion of all juniors and seniors at their high school with part-time jobs after school. Each eleventh grader took a random sample of 30 juniors and seniors and then calculated the proportion with part-time jobs. The mean is 0.67 and the standard deviation is 0.1.

Find the margin of error and the confidence interval.

$$MOE = 2(SD)$$

$$= 2(0.1)$$

$$= 0.2$$

$$CI = \text{mean} \pm 2(SD)$$

$$0.67 + 2(0.1) = 0.87$$

$$0.67 - 2(0.1) = 0.47$$

$$(0.47, 0.87)$$

Do you think that the proportion of all juniors and seniors at the school with part-time jobs could be 0.7? Do you think it could be 0.5? Justify your answers.

• Yes, 0.7 is inside the confidence interval

• So yes, 0.5 is inside the confidence interval

3. The following is an example of a sampling distribution of sample proportions of heads in 40 flips of a coin. The mean is .4955 and the sample standard deviation is .0852.

Find the margin of error and the confidence interval.

$$MOE = 2(0.0852)$$

$$= 0.1704$$

$$CI = \text{mean} \pm 2(SD)$$

$$0.4955 + 2(0.0852) = 0.6659$$

$$0.4955 - 2(0.0852) = 0.3251$$

$$(0.3251, 0.6659)$$

Fred flipped a coin 40 times and 65% of the flips came up heads. Is this an expected outcome? Explain your answer.

Yes, 0.65 is inside the confidence interval.

Fred flipped a coin 40 times and 75% of the flips came up heads. Is this an expected outcome? Explain your answer.

No, 0.75 is not inside the confidence interval.

$$6(60) = 360$$

8. Elizabeth waited for 6 minutes at the drive thru at her favorite fast-food restaurant the last time she visited. She was upset about having to wait that long and notified the manager. The manager assured her that her experience was very unusual and that it would not happen again. A study of customers commissioned by this restaurant found an approximately normal distribution of results. The mean wait time was 226 seconds and the standard deviation was 38 seconds. Given these data, and using a 95% level of confidence, was Elizabeth's wait time unusual? Justify your answer.

$$CI = \text{mean} \pm 2(SD)$$

$$CI = 226 + 2(38) = 302$$

$$226 - 2(38) = 150$$

$$[150, 302]$$

Yes, 360 is not
inside the
confidence interval.

confidence interval

9. Jessica got 20 math problems for homework and complained to her teacher that this was an unusual amount of homework. Her teacher told her to look at the number of questions in all of her past homework assignments from the school year and find the range of the expected number of math problems. She found that the mean was 11.2 and the standard deviation was 3. Was Jessica correct that 20 math problems was unusual? Justify your answer.

$$CI = 11.2 + 2(3) = 17.2$$

$$11.2 - 2(3) = 5.2$$

$$[5.2, 17.2]$$

Yes, 20 is unusual because
it is not inside the
confidence interval.

10. Fatima bought a chicken burrito for dinner and was unhappy with the amount of chicken that she received. She received 4.75 ounces of chicken and believed that this was less than normal. The manager conducted a study and found that the mean amount of chicken on their burritos was 5.1 ounces with a standard deviation of .25 ounces. Did Fatima's burrito have an expected amount of chicken? Justify your answer.

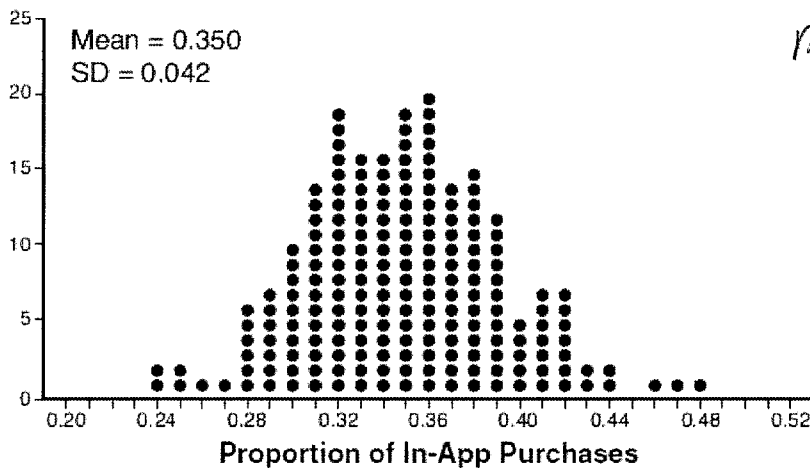
$$CI = 5.1 + 2(.25) = 5.6$$

$$5.1 - 2(.25) = \cancel{4.6} 4.6$$

$$[4.6, 5.6]$$

Yes, it was
an expected amount
because 4.75 is
inside the confidence
interval.

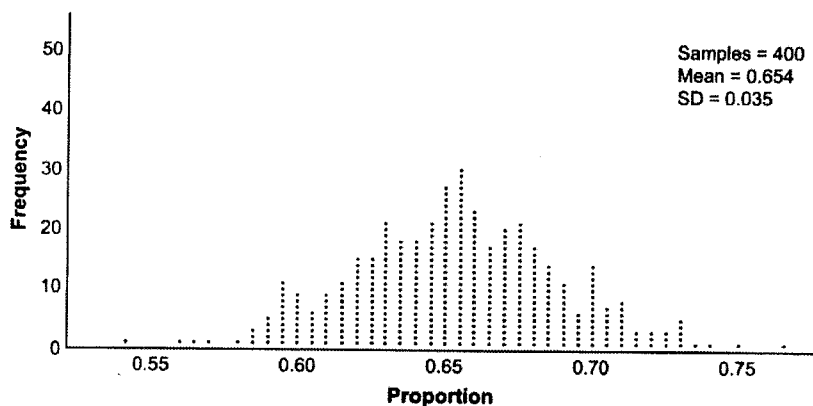
7. Some smart-phone applications contain "in-app" purchases, which allow users to purchase special content within the application. A random sample of 140 users found that 35 percent made in-app purchases. A simulation was conducted with 200 samples of 140 users assuming 35 percent of the samples make in-app purchases. The approximately normal results are shown below. Considering the middle 95% of the data, determine the margin of error, to the nearest hundredth, for the simulated results.



$$MOE = 2(.042)$$

$$= .08$$

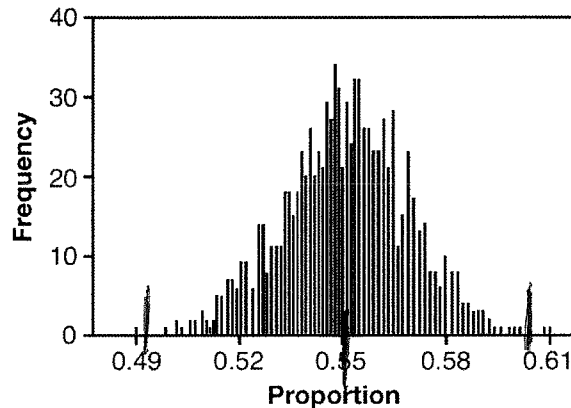
8. Betty conducted a survey of her class to see if they like pizza. She gathered 200 responses and 65% of the voters said they did like pizza. Betty then ran a simulation of 400 more surveys, each with 200 responses, assuming that 65% of the voters would like pizza. The output of the simulation is shown below. Considering the middle 95% of the data, what is the margin of error for the simulation?



$$MOE = 2(.035)$$

$$= .07$$

9. A candidate for political office commissioned a poll. His staff received responses from 900 likely voters and 55% of them said they would vote for the candidate. The staff then conducted a simulation of 1000 more polls of 900 voters, assuming that 55% of voters would vote for their candidate. The output of the simulation is shown in the diagram below.

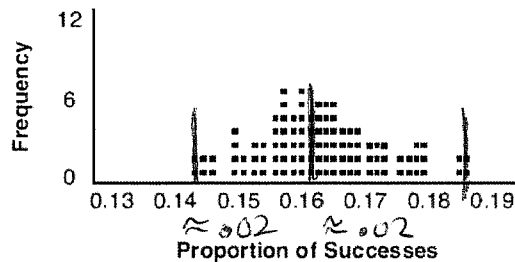


$$\begin{array}{r} .60 \\ - .55 \\ \hline .05 \end{array} \quad \begin{array}{r} .55 \\ - .49 \\ \hline .06 \end{array}$$

Given this output, and assuming a 95% confidence level, the margin of error for the poll is closest to

- 1) 0.01
- 2) 0.03
- 3) 0.06 *only value that's close*
- 4) 0.12

10. A study conducted in 2004 in New York City found that 212 out of 1334 participants had hypertension. Kim ran a simulation of 100 studies based on these data. The output of the simulation is shown in the diagram below.



At a 95% confidence level, the proportion of New York City residents with hypertension and the margin of error are closest to

- 1) proportion $\approx .16$; margin of error $\approx .01$
- 2) proportion $\approx .16$; margin of error $\approx .02$
- 3) proportion $\approx .01$; margin of error $\approx .16$
- 4) proportion $\approx .02$; margin of error $\approx .16$