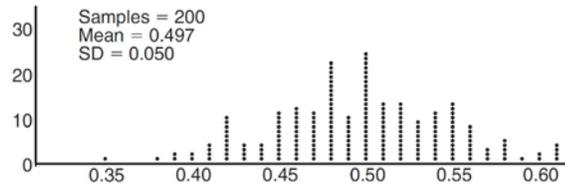


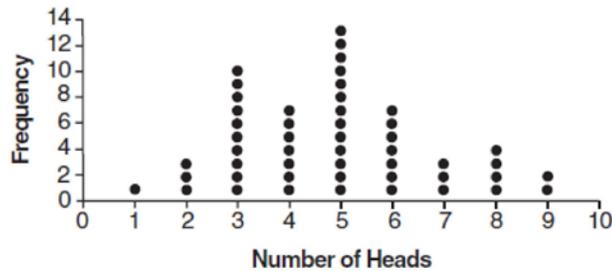
S.IC.A.2: Analysis of Data

- 1 Anne has a coin. She does not know if it is a fair coin. She flipped the coin 100 times and obtained 73 heads and 27 tails. She ran a computer simulation of 200 samples of 100 fair coin flips. The output of the proportion of heads is shown below.



Given the results of her coin flips and of her computer simulation, which statement is most accurate?

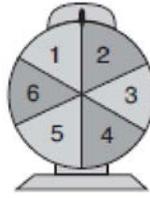
- 1) 73 of the computer's next 100 coin flips will be heads. 3) Her coin is not fair.
 2) 50 of her next 100 coin flips will be heads. 4) Her coin is fair.
- 2 The results of simulating tossing a coin 10 times, recording the number of heads, and repeating this 50 times are shown in the graph below.



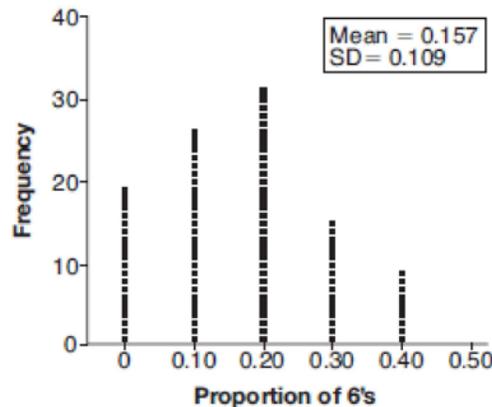
Based on the results of the simulation, which statement is *false*?

- 1) Five heads occurred most often, which is consistent with the theoretical probability of obtaining a heads. 3) Obtaining three heads or fewer occurred 28% of the time.
 2) Eight heads is unusual, as it falls outside the middle 95% of the data. 4) Seven heads is not unusual, as it falls within the middle 95% of the data.

- 3 A game spinner is divided into 6 equally sized regions, as shown in the diagram below.



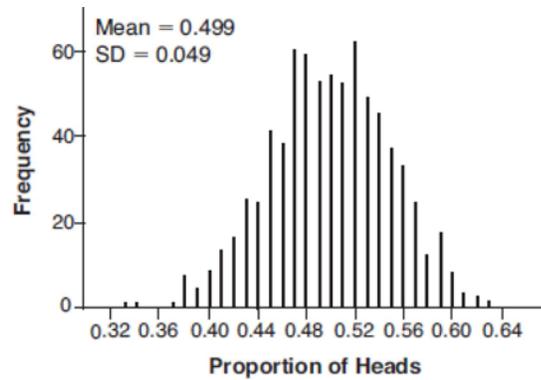
For Miles to win, the spinner must land on the number 6. After spinning the spinner 10 times, and losing all 10 times, Miles complained that the spinner is unfair. At home, his dad ran 100 simulations of spinning the spinner 10 times, assuming the probability of winning each spin is $\frac{1}{6}$. The output of the simulation is shown in the diagram below.



Which explanation is appropriate for Miles and his dad to make?

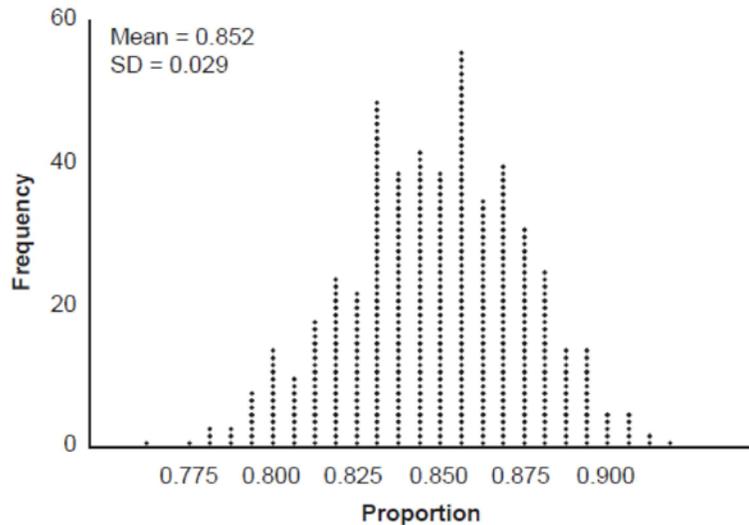
- 1) The spinner was likely unfair, since the number 6 failed to occur in about 20% of the simulations.
 - 2) The spinner was likely unfair, since the spinner should have landed on the number 6 by the sixth spin.
 - 3) The spinner was likely not unfair, since the number 6 failed to occur in about 20% of the simulations.
 - 4) The spinner was likely not unfair, since in the output the player wins once or twice in the majority of the simulations.
- 4 An orange-juice processing plant receives a truckload of oranges. The quality control team randomly chooses three pails of oranges, each containing 50 oranges, from the truckload. Identify the sample and the population in the given scenario. State *one* conclusion that the quality control team could make about the population if 5% of the sample was found to be unsatisfactory.
- 5 A survey was given to 1250 randomly selected high school students at the end of their junior year. The survey offered four post-graduation options: two-year college, four-year college, military, or work. Of the 1250 responses, 475 chose a four-year college. State *one* possible conclusion that can be made about the population of high school juniors, based on this survey.

- 6 Mrs. Jones had hundreds of jelly beans in a bag that contained equal numbers of six different flavors. Her student randomly selected four jelly beans and they were all black licorice. Her student complained and said "What are the odds I got all of that kind?" Mrs. Jones replied, "simulate rolling a die 250 times and tell me if four black licorice jelly beans is unusual." Explain how this simulation could be used to solve the problem.
- 7 Robin flips a coin 100 times. It lands heads up 43 times, and she wonders if the coin is unfair. She runs a computer simulation of 750 samples of 100 fair coin flips. The output of the proportion of heads is shown below.



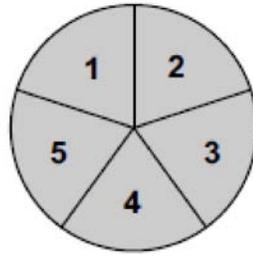
Do the results of the simulation provide strong evidence that Robin's coin is unfair? Explain your answer.

- 8 An app design company believes that the proportion of high school students who have purchased apps on their smartphones in the past 3 months is 0.85. A simulation of 500 samples of 150 students was run based on this proportion and the results are shown below.

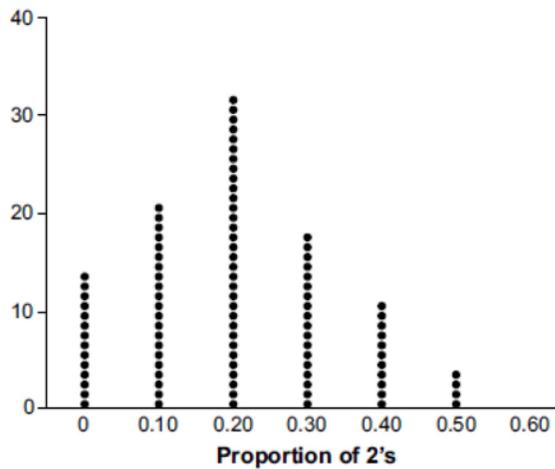


Suppose a sample of 150 students from your high school showed that 88% of students had purchased apps on their smartphones in the past 3 months. Based on the simulation, would the results from your high school give the app design company reason to believe their assumption is *incorrect*? Explain.

- 9 Joette is playing a carnival game. To win a prize, one has to correctly guess which of five equally sized regions a spinner will land on, as shown in the diagram below.

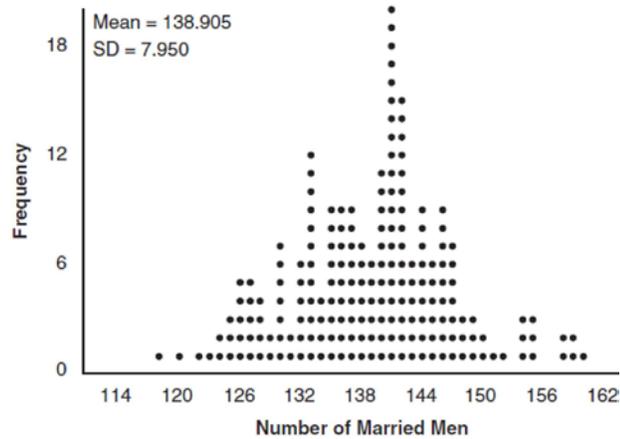


She complains that the game is unfair because her favorite number, 2, has only been spun once in ten times she played the game. State the proportion of 2's that were spun. State the theoretical probability of spinning a 2. The simulation output below shows the results of simulating ten spins of a fair spinner, repeated 100 times.

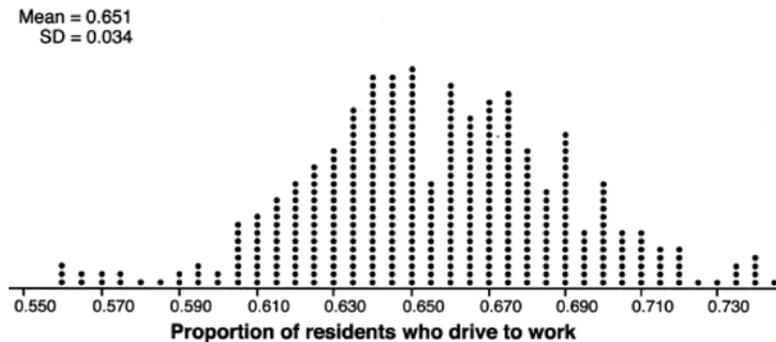


Does the output indicate that the carnival game was unfair? Explain your answer.

- 10 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.
- 11 In order to decrease the percentage of its residents who drive to work, a large city launches a campaign to encourage people to use public transportation instead. Before starting the campaign, the city's Department of Transportation uses census data to estimate that 65% of its residents drive to work. The Department of Transportation conducts a simulation, shown below, run 400 times based on this estimate. Each dot represents the proportion of 200 randomly selected residents who drive to work.

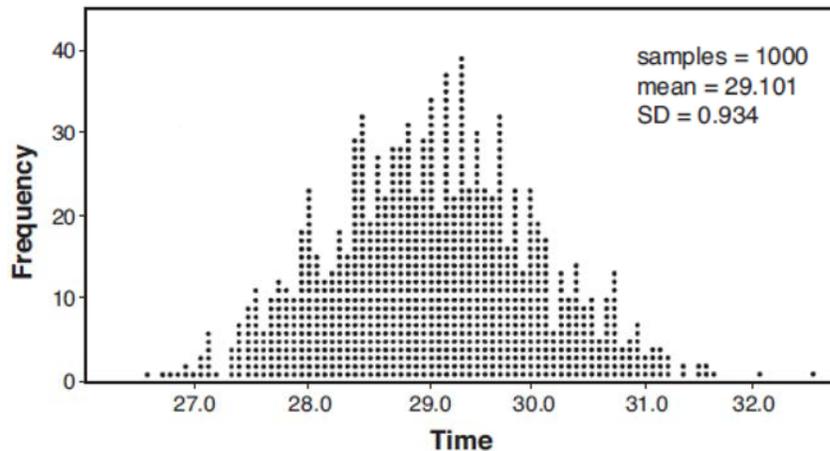


Use the simulation results to construct a plausible interval containing the middle 95% of the data. Round your answer to the *nearest hundredth*. One year after launching the campaign, the Department of Transportation conducts a survey of 200 randomly selected city residents and finds that 122 of them drive to work. Should the department conclude that the city's campaign was effective? Use statistical evidence from the simulation to explain your answer.

- 12 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.

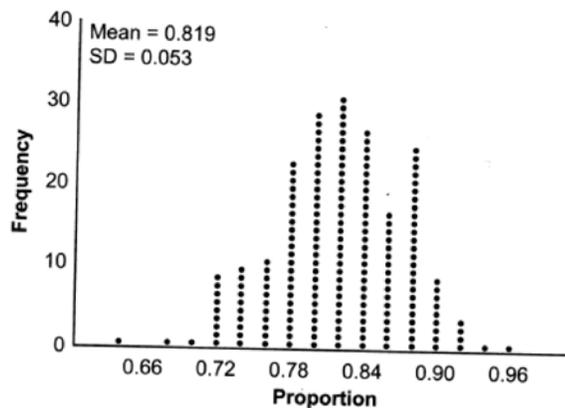
\bar{x}	29.11
s_x	20.718

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*.

- 13 State officials claim 82% of a community want to repeal the 30 mph speed limit on an expressway. A community organization devises a simulation based on the claim that 82% of the community supports the repeal. Each dot on the graph below represents the proportion of community members who support the repeal. The graph shows 200 simulated surveys, each of sample size 60.



Based on the simulation, determine an interval containing the middle 95% of plausible proportions. Round your answer to the *nearest thousandth*. The community organization conducted its own sample survey of 60 people and found 70% supported the repeal. Based on the results of the simulation, explain why the organization should question the State officials' claim.

S.IC.A.2: Analysis of Data**Answer Section**

1 ANS: 3 REF: 061607aai

2 ANS: 2 REF: 011820aai

3 ANS: 3 REF: 061710aai

4 ANS:

sample: pails of oranges; population: truckload of oranges. It is likely that about 5% of all the oranges are unsatisfactory.

REF: 011726aai

5 ANS:

About $38\% \left(\frac{475}{1250} \right)$ of high school juniors in the population will choose a four-year college.

REF: 012432aai

6 ANS:

Since there are six flavors, each flavor can be assigned a number, 1-6. Use the simulation to see the number of times the same number is rolled 4 times in a row.

REF: 081728aai

7 ANS:

No. $0.499 \pm 2(0.049) \rightarrow 0.401 - 0.597$. Since 0.43 falls within this interval, Robin's coin is likely not unfair.

REF: 061932aai

8 ANS:

No. $0.852 \pm 2(0.029) \rightarrow 0.794 - 0.91$. 0.88 falls within this interval.

REF: 062332aai

9 ANS:

$\frac{1}{10}, \frac{1}{5}$, and no, since 0.10 clearly falls within 95% of 0.20.

REF: 012334aai

10 ANS:

$138.905 \pm 2 \cdot 7.95 = 123 - 155$. No, since 125 (50% of 250) falls within the 95% interval.

REF: 011835aai

11 ANS:

$.651 \pm 2 \cdot .034 = .58 - .72$. No, since .61 (122/200) falls within the 95% interval.

REF: 062235aai

12 ANS:

$29.101 \pm 2 \cdot 0.934 = 27.23 - 30.97$. Yes, since 30 falls within the 95% interval.

REF: 011935aai

13 ANS:
 $.819 \pm 2 \cdot .053 = .713 - .925$. Since .70 does not fall within the 95% interval.

REF: 082236aii