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Algebra II

## ***Statistics Review Sheet***

1. A doctor wants to test the effectiveness of a new drug on her patients. She separates her sample of patients into two groups and administers the drug to only one of these groups. She then compares the results. Which type of study *best* describes this situation?

- 1) census
- 2) survey
- 3) observation
- 4) controlled experiment

2. A market research firm needs to collect data on viewer preferences for local news programming in Buffalo. Which method of data collection is most appropriate?

- 1) census
- 2) survey
- 3) observation
- 4) controlled experiment

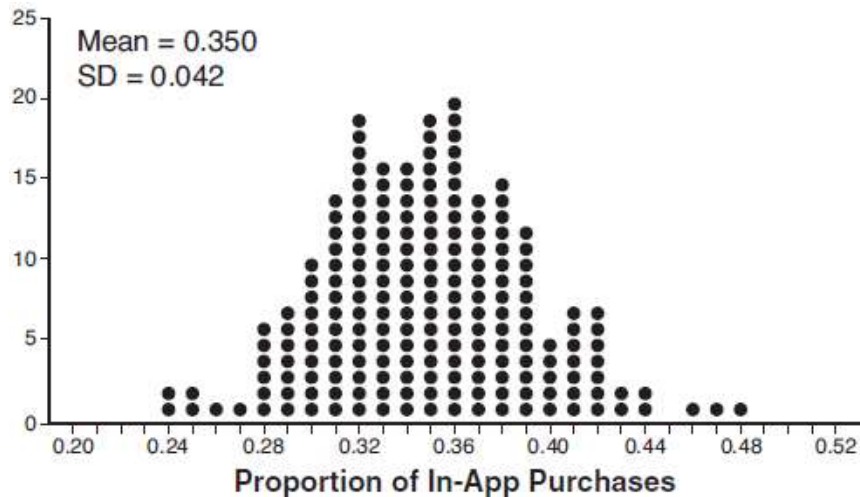
3. Which survey is *least* likely to contain bias?

- 1) surveying a sample of people leaving a movie theater to determine which flavor of ice cream is the most popular
- 2) surveying the members of a football team to determine the most watched TV sport
- 3) surveying a sample of people leaving a library to determine the average number of books a person reads in a year
- 4) surveying a sample of people leaving a gym to determine the average number of hours a person exercises per week

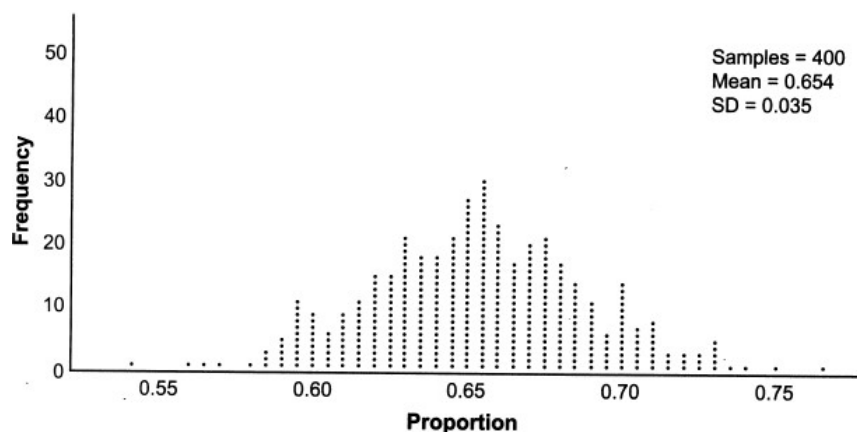
4. A survey is to be conducted in a small upstate village to determine whether or not local residents should fund construction of a skateboard park by raising taxes. Which segment of the population would provide the most unbiased responses?

- 1) a club of local skateboard enthusiasts
- 2) senior citizens living on fixed incomes
- 3) a group opposed to any increase in taxes
- 4) every tenth person 18 years of age or older walking down Main St.

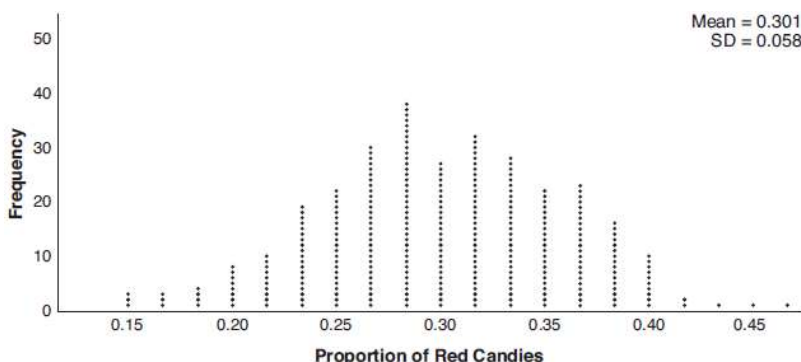
5. Some smart-phone applications contain "in-app" purchases, which allow users to purchase special content within the application. A random sample of 140 users found that 35 percent made in-app purchases. A simulation was conducted with 200 samples of 140 users assuming 35 percent of the samples make 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.



6. 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?

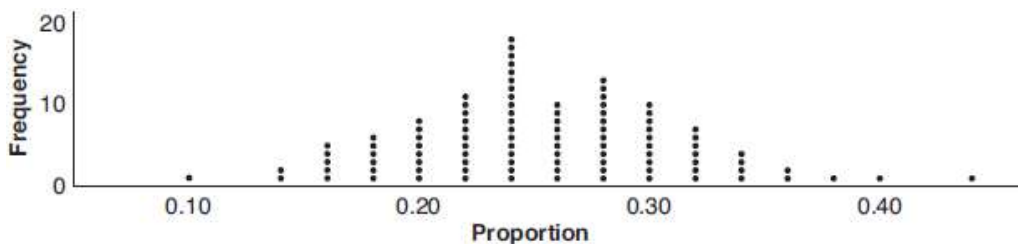


7. Mary bought a pack of candy. The manufacturer claims that 30% of the candies manufactured are red. In her pack, 14 of the 60 candies are red. She ran a simulation of 300 samples, assuming the manufacturer is correct. The results are shown below.



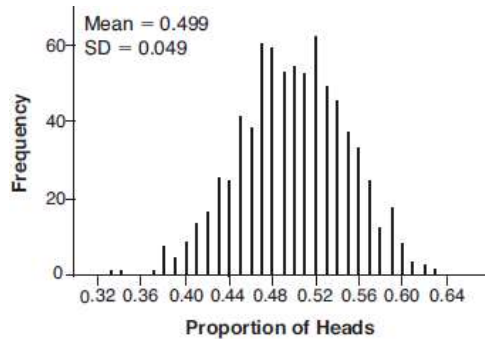
Based on the simulation, determine the middle 95% of plausible values that the proportion of red candies in a pack is within. Based on the simulation, is it unusual that Mary's pack had 14 red candies out of a total of 60? Explain.

8. 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.

9. 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.

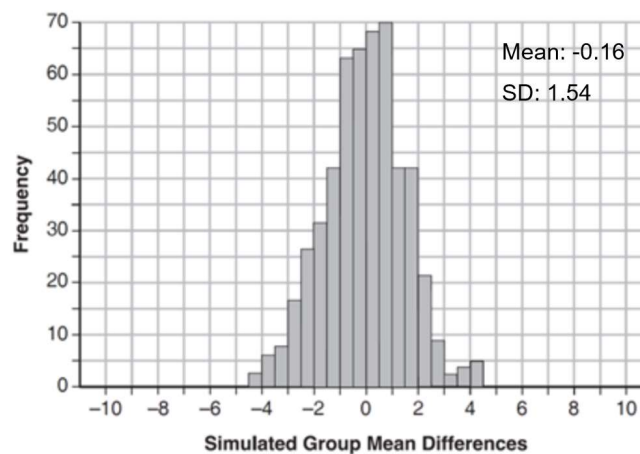


10. Juanita rolls a 6 sided die and recorded that it landed on 6 five times out of 50. She questioned whether the die was fair so she ran a computer simulation of 1000 samples of 50 rolls of a fair die. The mean of the simulation was .159 with a standard deviation of .102. Is her die fair? Explain your answer.

11. Seventy-two students are randomly divided into two equally-sized study groups. Each member of the first group (group 1) is to meet with a tutor after school twice each week for one hour. The second group (group 2), is given an online subscription to a tutorial account that they can access for a maximum of two hours each week. Students in both groups are given the same tests during the year. A summary of the two groups' final grades is shown below:

|           | Group 1 | Group 2 |
|-----------|---------|---------|
| $\bar{x}$ | 80.16   | 83.8    |
| $S_x$     | 6.9     | 5.2     |

Calculate the mean difference in the final grades (group 1 – group 2) and explain its meaning in the context of the problem. A simulation was conducted in which the students' final grades were rerandomized 500 times. The results are shown below.



Use the simulation to determine if there is a significant difference in the final grades. Explain your answer.

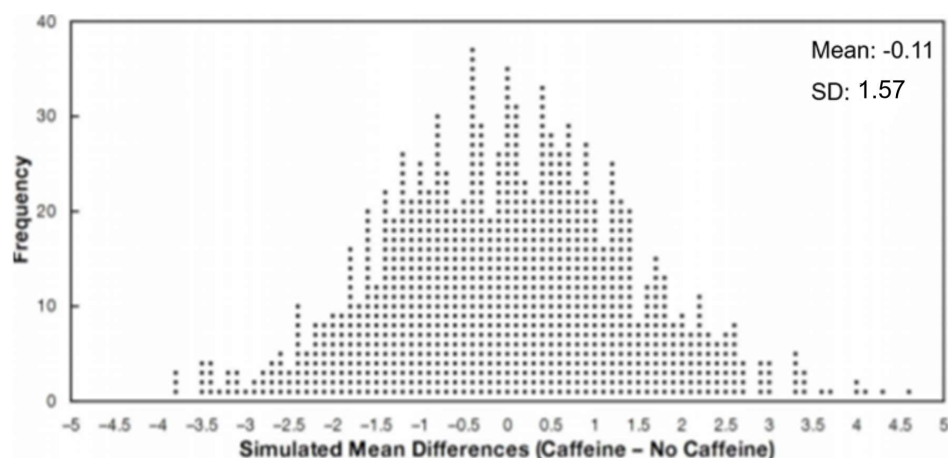
12.

The effects of caffeine on the body have been extensively studied. In one experiment, researchers trained a sample of male college students to tap their fingers at a rapid rate. The sample was then divided at random into two groups of 10 students each. Each student drank the equivalent of about two cups of coffee, which included about 200 mg of caffeine for the students in one group but was decaffeinated coffee for the second group. After a 2-hour period, each student was tested to measure finger tapping rate (taps per minute). The students did not know whether or not their drinks included caffeine and the person measuring the tap rates was also unaware of the groups. The finger-tapping rates measured in this experiment are summarized in the table below.

|             |     |     |     |     |     |     |     |     |     |     | Mean  |
|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|
| Caffeine    | 246 | 248 | 250 | 252 | 248 | 250 | 246 | 248 | 245 | 250 | 248.3 |
| No Caffeine | 242 | 245 | 244 | 248 | 247 | 248 | 242 | 244 | 246 | 242 | 244.8 |

Calculate the mean difference (Caffeine – No Caffeine) and interpret your answer in the context of the problem.

The researchers then took the twenty finger-tapping rates and rerandomized them 1,000 times using simulation software. The output of the simulation results is shown in the dotplot below.



Does the simulation data support the conclusion that caffeine causes an increase in average finger-tapping rate? Justify your answer.