

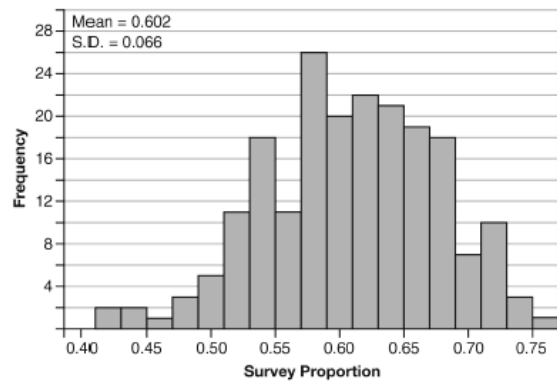
Name _____
Date: _____

MRS22-Additional Work 5

1. Describe how a controlled experiment can be created to examine the effect of ingredient X in a toothpaste.

2. 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.



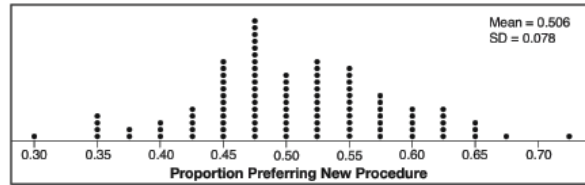
Using the results of the simulation, determine a plausible interval containing the middle 95% of the data. Round all values to the *nearest hundredth*.

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.

3. The weight of a bag of pears at the local market averages 8 pounds with a standard deviation of 0.5 pound. The weights of all the bags of pears at the market closely follow a normal distribution. Determine what percentage of bags, to the *nearest integer*, weighed *less* than 8.25 pounds.

4.

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.

5.

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.

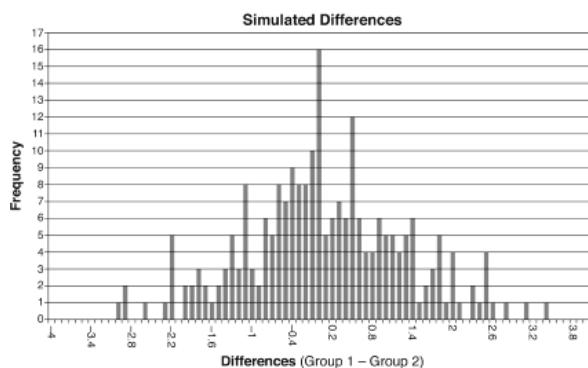
6.

Ayva designed an experiment to determine the effect of a new energy drink on a group of 20 volunteer students. Ten students were randomly selected to form group 1 while the remaining 10 made up group 2. Each student in group 1 drank one energy drink, and each student in group 2 drank one cola drink. Ten minutes later, their times were recorded for reading the same paragraph of a novel. The results of the experiment are shown below.

Group 1 (seconds)	Group 2 (seconds)
17.4	23.3
18.1	18.8
18.2	22.1
19.6	12.7
18.6	16.9
16.2	24.4
16.1	21.2
15.3	21.2
17.8	16.3
19.7	14.5
Mean = 17.7	Mean = 19.1

- a) Ayva thinks drinking energy drinks makes students read faster. Using information from the experimental design or the results, explain why Ayva's hypothesis may be *incorrect*.

Using the given results, Ayva randomly mixes the 20 reading times, splits them into two groups of 10, and simulates the difference of the means 232 times.



- b) Ayva has decided that the difference in mean reading times is *not* an unusual occurrence. Support her decision using the results of the simulation. Explain your reasoning.

7.

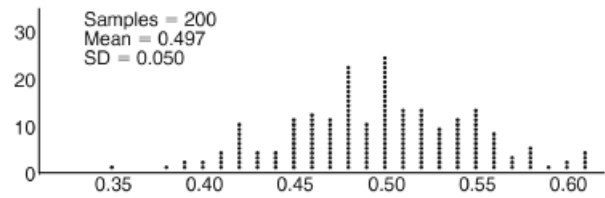
Julie averaged 85 on the first three tests of the semester in her mathematics class. If she scores 93 on each of the remaining tests, her average will be 90. Which equation could be used to determine how many tests, T , are left in the semester?

(1) $\frac{255 + 93T}{3T} = 90$ (3) $\frac{255 + 93T}{T + 3} = 90$

(2) $\frac{255 + 90T}{3T} = 93$ (4) $\frac{255 + 90T}{T + 3} = 93$

8.

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.
- (2) 50 of her next 100 coin flips will be heads.
- (3) Her coin is not fair.
- (4) Her coin is fair.

9.

The heights of women in the United States are normally distributed with a mean of 64 inches and a standard deviation of 2.75 inches. The percent of women whose heights are between 64 and 69.5 inches, to the *nearest whole percent*, is

- | | |
|--------|--------|
| (1) 6 | (3) 68 |
| (2) 48 | (4) 95 |

11.

10.

Cheap and Fast gas station is conducting a consumer satisfaction survey. Which method of collecting data would most likely lead to a biased sample?

- (1) interviewing every 5th customer to come into the station
- (2) interviewing customers chosen at random by a computer at the checkout
- (3) interviewing customers who call an 800 number posted on the customers' receipts
- (4) interviewing every customer who comes into the station on a day of the week chosen at random out of a hat

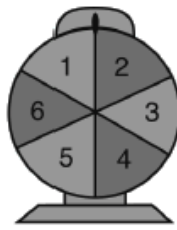
12.

Which statement(s) about statistical studies is true?

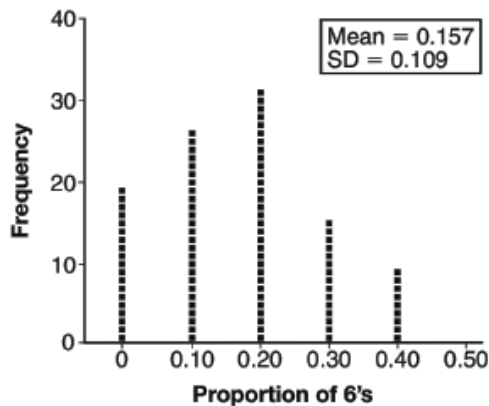
- I. A survey of all English classes in a high school would be a good sample to determine the number of hours students throughout the school spend studying.
- II. A survey of all ninth graders in a high school would be a good sample to determine the number of student parking spaces needed at that high school.
- III. A survey of all students in one lunch period in a high school would be a good sample to determine the number of hours adults spend on social media websites.
- IV. A survey of all Calculus students in a high school would be a good sample to determine the number of students throughout the school who don't like math.

- | | |
|--------------|----------------|
| (1) I, only | (3) I and III |
| (2) II, only | (4) III and IV |

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 following diagram.



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.

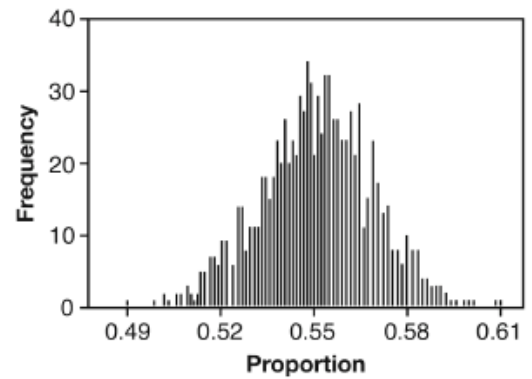
13.

The lifespan of a 60-watt lightbulb produced by a company is normally distributed with a mean of 1450 hours and a standard deviation of 8.5 hours. If a 60-watt lightbulb produced by this company is selected at random, what is the probability that its lifespan will be between 1440 and 1465 hours?

- (1) 0.3803
- (2) 0.4612
- (3) 0.8415
- (4) 0.9612

14.

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.



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
- (4) 0.12