

2. Jane is going out of town for a week. Her favorite tv show is The Big Bang Theory (TBBT) and she sets her DVR to record an hour's worth of episodes on the tbs network on each of the seven days she is out of town. Unfortunately, Jane's DVR has a glitch. The glitch causes the DVR to record a random hour (starting on the hour. Examples 3:00pm, 4:00am, etc..)of tbs programs each day. During the week that Jane is out of town tbs is showing TBBT each day from 3:00 pm to 6:00pm and from 8:00pm to 11:00pm.

(d) On the first day Jane is gone, what is the probability that her DVR recorded an hour of TBBT?

(e) Find the probability that Jane's DVR recorded no episodes of TBBT while she was gone. ☹

(f) Let X be the number of hours of TBBT that Jane's DVR recorded during the week she was gone. What is the probability distribution of X ?

(g) Find the probability that Jane's DVR recorded exactly 3 hours of TBBT.

(h) Find the probability that Jane's DVR recorded 5 or more hours of TBBT.

(i) Find the probability that Jane's DVR recorded at least 2 hours of TBBT.

3. Your friend Jane's landscaping company charges two hours of labor time for the planting of a medium-sized tree. To make sure she is not undercharging or overcharging for this service, she asks for your help. To start, you take an SRS of 10 planting times from last month's landscaping work (times are in hours):

1.7 1.5 2.6 2.2 2.4 2.3 2.6 3.0 1.4 2.3

- (a) Compute the **sample mean**.
- (b) Compute the **sample standard deviation**.
- (c) Compute a **95% Confidence Interval** for the true mean planting time.
- (d) Perform a hypothesis test to see whether the mean tree-planting time differs from 2 hours. Use the Null Hypothesis $H_0: \mu = 2.0$ and Alternative Hypothesis $H_a: \mu \neq 2.0$. For the test use a level of significance of $\alpha = 0.05$.
- (e) If you were going to send an email to Jane to communicate your conclusions (assuming she did not take Math 305!), what would you say?

4. Virtual call centers are staffed by individuals working out of their homes. ABC Services is considering employing home-based agents, but only if a level of customer satisfaction greater than or equal to 80% can be maintained. A trial program was conducted using home-based agents. In an SRS of 300 customers, 252 reported that they were satisfied with the service they received.

(a) What is **sample proportion \hat{p}** ?

(b) What is the **standard error of \hat{p}** ?

(c) Compute a **95% Confidence Interval** for the true trial program satisfaction level.

(d) Conduct a hypothesis test to determine if the trial program sample supports the conclusion that the home-based agent satisfaction level meets the level required by ABC Services. Be sure to state your Null and Alternative Hypotheses, test statistic, p-value, and conclusion.

5. Your friend David works for an online magazine and calls you late one night. He says “Dude(tte), can you help me out? I’m putting together an article and the submission deadline is in an hour. I want to quote an opinion poll result my publisher gave me, but they didn’t give me the margin of error, you know that plus-minus thingy they always give with the main opinion poll result. You’re taking that Stat class right? Here’s the info I have; the magazine asked 185 people if they had ever watched an episode of the original “Star Trek” TV series. According to the magazine 46% said yes. Can you help? Hey, are you still awake?”

What would be an acceptable margin of error for this survey result? Write a sentence below that David could use in his article that summarizes the results.

6. Washington University banned smoking on the Hilltop campus starting in 2010. The student paper decides to do an opinion poll to see if current campus students/faculty/staff support the ban. Reporters are about to start asking a sample of 250 Hilltop people for their opinions.

(a) Describe a method of gathering opinions that would result in a poll **bias** in favor of the ban.

(b) Describe a method of gathering opinions that would result in a poll **bias** against the ban.

(c) Describe a method of gathering opinions that would keep the amount of **bias** in the poll results to a minimum

7. (ESSAY) Below are three situations. Choose **ONE** of the situations and describe how you would design an experiment to help the protagonist make an informed decision. Your description should include (but not be limited to) how subjects are chosen for the experiment, how treatments will be administered, what variable(s) you will be measuring, and your choice of a Null and Alternative Hypotheses.

Scenario A Robert thinks that he has formulated a super blend of green tea that relieves anxiety and will help students score better on exams.

Scenario B Mary is the head human resources/benefits for a local hospital complex. She is thinking about instituting on-site yoga classes as a way of reducing employee stress.

Scenario C Alexandria works for a biotech firm. She believes that she has created a new tomato hybrid with at least five times the amount of lycopene (a natural antioxidant) that is contained in a normal tomato.

BONUS QUESTIONS!! ☺

1. Each table below contains an **ERROR**. For each table, explain what the error is (don't try to figure out how to correct the table because you don't have enough information to do so. Just indicate why it is wrong!).

(a) The following table summarizes the grade breakdown on an exam in a large statistics class.

Grade	Percent Frequency
A	20%
B	45%
C	30%
D	10%
F	5%

(b) The following table summarizes the grade breakdown on an exam in a small statistics class with 10 students.

Grade	Percent Frequency
A	30%
B	35%
C	15%
D	20%
F	0%

2. A consumer group is testing a manufacturer's claim that a new car model will travel at least 30 miles per gallon of gasoline. Assume that $H_0: \mu = 30$ and $H_a: \mu < 30$, and that the population standard deviation σ is known and is equal to 3.2 miles per gallon. An SRS of 40 cars will be used for this test, with a level of significance of $\alpha = 0.01$.

Compute the **power** of this test assuming a proposed alternative value for μ of 27.5 miles per gallon (i.e. assuming $\mu_a = 27.5$).