

Stat 145: Exam 3 Review Questions

Note: This is not intended to be a preview of the actual exam. Rather, it is meant to give you an idea of the types of questions that will be asked. There are concepts in these review problems that will not appear on the actual exam, just as there will be concepts on the actual exam that are not covered in these review problems.

- The number of shark attacks per year in the United States is approximately Normally distributed with mean $\mu = 31.8$ and standard deviation $\sigma = 10.0$, according to data obtained from the Florida Museum of Natural History.
 - What is the probability a year chosen at random has less than 15 attacks?
 - Suppose an SRS of 25 years is chosen. Let \bar{X} be the sample mean number of attacks per year. What are the mean and standard deviation of the sampling distribution of \bar{X} ?
 - Is the sampling distribution of \bar{X} approximately Normal? Why or why not?
 - What is the probability that the mean number of attacks in the sampled years is greater than 35?
- The 2000 census allowed each person to choose from a long list of races. That is, in the eyes of the Census Bureau, you belong to whatever race you say you belong to. “Hispanic/Latino” is a separate category; Hispanics may be of any race. If we choose a resident of the United States at random, the 2000 census gives these probabilities:

	Hispanic	Not Hispanic
Asian	0.000	0.036
Black	0.003	0.121
White	0.060	0.691
Other	0.062	0.027

- Verify that this is a legitimate assignment of probabilities.
 - What is the probability that a randomly chosen American is Hispanic?
 - Non-Hispanic whites are the historical majority of the United States. What is the probability that a randomly chosen American is not a member of this group?
- The mayor of Albuquerque wants to sample adult residents of the city in order to estimate the percentage that favor his proposal to build a downtown sports arena. A random sample of size 900 is chosen; 40% of them favor the mayor’s proposal. Identify the population, parameter, sample, and statistic.

4. It is known that students at a particular university have a mean SAT score of 900. Believing that figure is low, Dave takes a simple random sample of ten students from the university, which yields a sample mean of $\bar{x} = 950$. Dave cites this as proof that the university is lying. Jill explains to Dave that the variation he observed in his small sample is likely due to random chance, and that the sample mean would likely be closer to 900 if he increased his sample size. What is Jill's argument based on?
5. Cards with the letters X, Y, and Z printed on them are placed in a hat. A card is drawn, the letter is recorded, the card is placed back in the hat, and a second card is drawn. There are nine possible arrangements of letters. For example, XY means the first card drawn had the letter X printed on it and the second card drawn had the letter Y printed on it. Assume all nine arrangements are equally likely.
 - (a) Write down all nine arrangements of letters.
 - (b) Let A be the event that both letters are the same. What outcomes make up this event?
 - (c) Find the probability of event A.
 - (d) Let B be the event that the letters differ. What outcomes make up this event?
 - (e) Find the probability of event B.
 - (f) Events A and B are said to be disjoint. Why?
6. An article in *The Journal of the American Medical Association* examined body temperatures of males and females. The mean body temperature of the 65 female subjects who participated in the study was 98.4 degrees Fahrenheit. Assume σ is known to be 0.72 degree.
 - (a) Is there evidence that the population mean body temperature of females is different from 98.6? Perform a test of significance to answer this question. Make sure you state your hypotheses, calculate the value of the test statistic, compute the P -value, and state your conclusion in terms of the problem.
 - (b) Give a 95% confidence interval for μ , the population mean body temperature of females.
 - (c) Explain in simple language to someone who knows no statistics what 95% confidence means.
 - (d) What is the value of z^* for a 94% confidence interval?
 - (e) How many females must be sampled in order to estimate μ within ± 0.1 degree with 95% confidence?
 - (f) Without doing any further calculations, explain how changing the confidence level in the problem above to 90% would affect the sample size.

7. Unoccupied seats on flights cause airlines to lose revenue. Suppose a large airline wants to estimate the average number of unoccupied seats per flight over the past year. To accomplish this, the records of 64 flights are randomly selected, and the number of unoccupied seats is noted for each of the sampled flights. The sample mean is $\bar{x} = 11.4$ seats. Assume the value of σ is known to be 4 seats.
- (a) In past years, the mean number of unoccupied seats is known to be 11. Has the mean number of unoccupied seats increased in the last year? Perform a test of significance to answer this question. Make sure you state your hypotheses, calculate the value of the test statistic, compute the P -value, and state your conclusion in terms of the problem.
- (b) The airline calculates a confidence interval for μ and reports that the margin of error is ± 0.98 . What confidence level did they use?