

Practice Exam 3 Math 150

1. A bone mineral density test is used to identify a bone disease. The result of a bone density test is commonly measured as a z-score, and the population of z-scores is normally distributed with a mean of 0 and a standard deviation of 1.
 - (a) For a randomly selected subject, find the probability of a bone density test score less than 2.93.
 - (b) For a randomly selected subject, find the probability of a bone density test score greater than -1.53.
 - (c) For a randomly selected subject, find the probability of a bone density test score between -1.07 and 2.07.
 - (d) If the mean bone density test score is found for 16 randomly selected subjects, find the probability that the mean is greater than 0.27.
2. Scores on the ACT test have a distribution that is approximately normal with mean 21.1 and standard deviation 5.1. A sample of 80 ACT scores is randomly selected and the mean is computed.
 - (a) Describe the distribution of such sample means.
 - (b) What is the mean of all such sample means?
 - (c) What is the standard deviation of all such sample means?
 - (d) What is the probability that a sample mean is greater than 23?
3. Standing eye heights of men are normally distributed with a mean of 1634mm and a standard deviation of 66mm.
 - (a) If a window is positioned so that it is comfortable for men with standing eye heights greater than 1500mm, what percentage of men will find that height comfortable?
 - (b) A window is positioned to be comfortable for the lowest 95% of eye heights of men. What standing eye height of men separates the lowest 95% from the highest 5%?
4. Under older Federal Aviation Administration rules, airlines were required to estimate the weight of a passenger as 185lb (including the 20 lb of carry-on baggage). Rules were revised to use an estimate of 195 lb. Men now have weights that are normally distributed with a mean of 182.9 lb and a standard deviation of 40.9 lb.
 - (a) For a randomly selected adult male with a 20 lb carry-on baggage, find the probability that his total weight is greater than 195 lb.
 - (b) If a Boeing 767-300 aircraft is full of 213 adult male passengers and each is assumed to have a 20 lb of carry on baggage, find the probability that the mean passenger weight (including the carry-on baggage) is greater than 195 lb. Based on that probability, does a pilot have to be concerned about exceeding the weight limits?
5. In a Gallup poll of 557 randomly selected adults, 284 said they were underpaid.
 - (a) Identify the best point estimate of the percentage of all adults who say that they were underpaid.
 - (b) Construct a 95% confidence interval estimate of the percentage of all adults who say that they were underpaid.
 - (c) Can we safely conclude that the majority of adults say that they were underpaid?
6. We want to find out the proportion of left-handed people in the world. How many people must we poll in order to be 99% confident that we are within two percentage points of the population percentage?

7. Identify the distribution (normal, Student t, χ^2) that applies to each of the following situations (if none is appropriate, then state that none is appropriate)
- (a) In constructing a confidence interval of μ , you have 50 sample values and they appear to be from a population with a skewed distribution. The population standard deviation is not known.
 - (b) In constructing a confidence interval estimate of μ , you have 50 sample values and they appear to be from a population with a skewed distribution. The population standard deviation is known to be 18.2 cm.
 - (c) In constructing a confidence interval estimate of σ , you have 50 sample values and they appear to be from a population with a skewed distribution.
 - (d) In constructing a confidence interval estimate of σ , you have 50 sample values and they appear to be from a population with a normal distribution.
 - (e) In constructing a confidence interval estimate of p , you have 850 survey responses and 10% answered “yes” to the first question.
8. You have been hired by a college foundation to conduct a survey of graduates.
- (a) If you want to estimate the percentage of graduates who have made a donation to the college after graduation, how many graduates must you survey if you want 98% confidence that your percentage has a margin of error of five percentage points?
 - (b) If you want to estimate the mean amount of all charitable contributions made by graduates, how many graduates must you survey if you want 98% confidence that your sample mean is in error by no more than \$50 (assume that you know from a pilot study that the standard deviation is approximately \$337)?
 - (c) If you plan to obtain the estimates described in parts (a) and (b) with a single survey containing several questions, how many graduates must be surveyed?
9. Data Set 13 in Appendix B includes crash test measurements for small cars. The seven chest deceleration measurements have a mean of 42.7 g and a standard deviation of 5.6 g, where g is a force of gravity. Assume that the sample is a simple random sample and the measurements satisfy the loose requirement of being from a normally distributed population.
- (a) Use the sample data to construct a 95% confidence interval estimate of the mean chest deceleration measurement for the population of all small cars.
 - (b) Use the sample data to construct a 95% confidence interval estimate of the population standard deviation.