

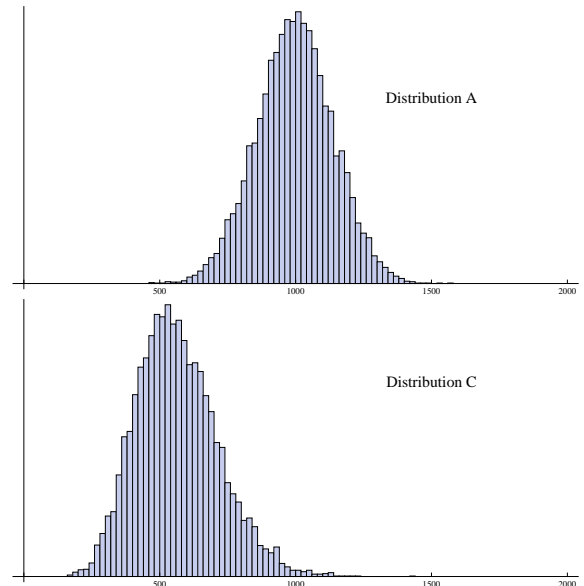
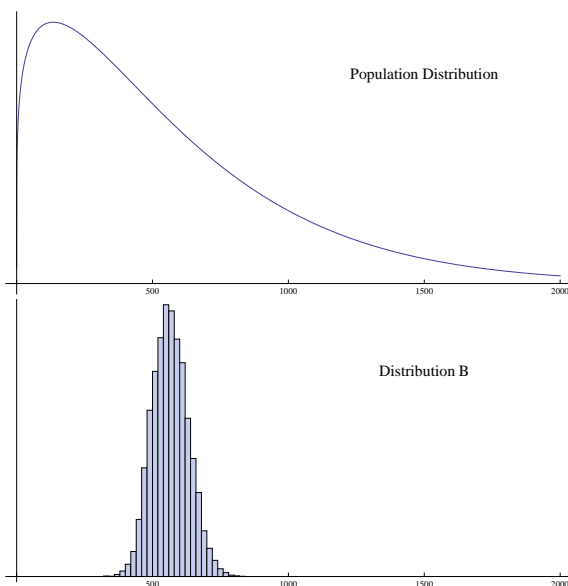
Instructions: This exam is a tool to help me (and you) assess how well you are learning the course material. As such, you should report enough written detail for me to understand how you are thinking about each problem. (100 points total)

1. You will be doing a study that involves a simple random sample of 120 college students. You want to know what to expect in terms of the proportion of females in a sample of this size. The proportion of females among all college students in the US is currently about 55%.
 - (a) Explain why it is reasonable to use a normal distribution for the distribution of sample proportions in this situation. (4 points)
 - (b) Determine the probability of selecting a simple random sample of 120 college students and getting 62% or more females. (10 points)

2. (a) From our study of sample proportions, we know that $\mu_{\hat{p}} = p$. What does this tell us about using a sample proportion \hat{p} to estimate the population proportion p ? (3 points)
- (b) From our study of sample proportions, we know that $\sigma_{\hat{p}} = \sqrt{\frac{p(1-p)}{n}}$. What does this tell us about using a sample proportion \hat{p} to estimate the population proportion p ? (3 points)

3. The distribution of lifetimes (hours) for a particular type of lightbulb is shown in the top left plot. The mean lifetime is 564 hours with a standard deviation of 472 hours. Below it are three other distributions (labeled A , B , and C) that are for
 - _____ the distribution of sample means from 10,000 samples of size 10
 - _____ the distribution of sample means from 10,000 samples of size 100
 - _____ a distribution of 10,000 values with no direct connection to the population distribution

These are not necessarily in order. Match each of A , B , and C with one of the descriptions. Explain how you reach your conclusions. (12 points)



4. Birth weights for full-term newborns have a roughly normal distribution. Suppose we somehow know the standard deviation for these birth weights is 570 grams but we don't know the mean. We find birth weights for a simple random sample of 150 full-term newborns and compute a sample mean of 3245 grams.
- (a) Compute the 95% confidence interval for the population mean based on this sample. (15 points)
 - (b) A friend claims that 95% of all full-term newborns have a birth weight that falls in the interval from (a). Explain why this is not correct. (3 points)
 - (c) Another friend claims that there is a 95% probability that the population mean is in the interval from (a). Explain why this is not correct. (3 points)
 - (d) Explain to your two friends what is true about the interval from (a) in relation to the value 95%. (4 points)
5. The mean (systolic) blood pressure for females ages 35-44 in the US is 127.3 with a standard deviation of 8.0 (in units of mmHg for "mm of mercury"). Researchers are interested in determining whether mean blood pressure for diabetic women in the same age group differs from the general population. Let μ be the mean blood pressure for diabetic women ages 35-44 in the US.
- (a) Set up null and alternative hypotheses for this situation. (4 points)
 - (b) The researchers measure blood pressure on a sample of 101 diabetic women ages 35-44 and find a sample mean of $\bar{x} = 129.0$. Use this value to carry out a significance test on your hypotheses from (a) with a significance level of $\alpha = 0.05$. (15 points)
 - (c) Write a brief conclusion using non-technical language that would be suitable for a newspaper article. (3 points)
 - (d) List any assumptions you made in carrying out the significance test in (b). (3 points)
6. Microsoft is interested in knowing the proportion of Windows Vista users in the U.S. who are satisfied with that operating system. Microsoft plans to hire a polling company to conduct a sample survey that will return a 95% confidence interval for the proportion of Vista users in the US who are satisfied. Due to a computer glitch, 120 different Microsoft managers independently take on the same task. Each contacts a different polling company so 120 different sample surveys are conducted. Would you expect all of the 120 confidence intervals that get reported to contain the true value of the proportion? Explain your reasoning in reaching a conclusion. (10 points)
7. You calculate a 93% confidence interval for a population mean from a set of sample data. You then calculate a 96% confidence interval using the same set of data. Would the 96% confidence interval be narrower than, the same as, or wider than the 93% confidence interval? Explain your reasoning in reaching a conclusion. (8 points)