Math13 - Introduction to Statistics, Fall 2015

Take Home Assignment; December

NAME: _____ ID: _____

Write down all your steps and include drawings of normal curves. No work shown, no credit.

1) The heights of adult males are normally distributed with a mean of 69 inches and a standard deviation of 2.8 inches. Let X denote the height of a randomly chosen male adult. Find. *[8]*

a) P(X > 65)
b) P(62 < X < 72)
c) P(|X - 69| > 6)
d) P(63 < X < 75)
e) P(X > 72)
f) P(X < 60)
g) x if P(X > x) = 0.01
h) x if P(X < x) = 0.95

2) In tests conducted on jet pilots, it was found that their blackout thresholds are normally distributed with a mean 4.5*g* and a standard deviation of 0.7*g*. *[8]*

a) If only those pilots whose thresholds are in the top 25 percent are to be allowed to apply to become astronauts, what is the cutoff point?
b) Find the proportion of jet pilots who have blackout thresholds above 5g
c) Find the proportion of jet pilots who have blackout thresholds below 4g
d) Find the proportion of jet pilots who have blackout thresholds between 3.7g and 5.2g

3) The salaries of physicians in a certain speciality are approximately normally distributed. If 25% of these physicians earn below 180,000 dollars, and 25% earn above 320,000 what fraction earn: *[4]*

a) below 250,000 dollars?
b) between 260,000 and 300,000 dollars?

4) Consider a sample size of 50 from a population having mean μ = 100 and standard deviation σ = 9. What is the probability that the **sample mean** $\overline{X}$ lies between 96 and 104. *[5 points]*

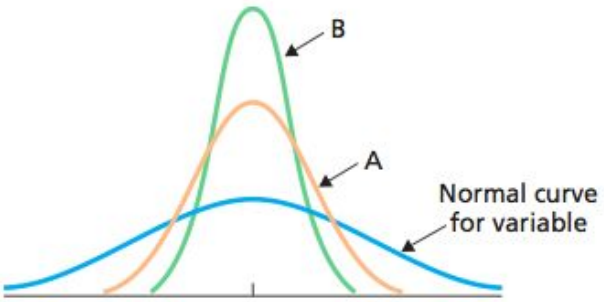
5) A random sample of *n* = 36 coffee shops gave a **sample mean** price of $\overline{X} = \$3.45$ for a cappuccino. Assume that the standard deviation is known with a value of σ = \$0.84.

a. What's the probability that the mean price $\overline{X}$ lies between \$3.30 and \$3.70. *[2 points]*
b. Find the 90% confidence interval for the average price $\overline{X}$ of a cappuccino. *[3 points]*
c. What's the margin of error? *[2 points]*

6) The **sample mean** of the scores on a economics exam was 60 with a sample standard deviation of 20, while the **sample mean** of the scores on a statistics exam was 55 with a sample standard deviation of 10. Joe scored 70 on the economics exam and 62 on the statistics exam. Assume that the tests scores on both exams approximately follow a normal distribution.

a) On which exam is the percentage of scores that are below Joe's score the highest?
b) Approximate the percentage of scores on the economics exam that were below Joe's score?
c) Approximate the percentage of scores on the statistics exam that were below Joe's score?

7) The graph below shows the curve of a normal variable (in blue). Superimposed are the curves (A and B) for the sampling distributions of the **sample mean** $\overline{X}$ for two different sample sizes *[10 points]*



a. Explain why all three curves are centered at the same place.
b. Which curve, A or B, corresponds to the larger sample size? Explain your answer.
c. Give a reason of why the spread of curve A is different from the spread of curve B.
d. Which of the two sampling-distribution curves (A or B) correspond to the sample size that will tend to produce less sampling error?
e. Why are the two curves A and B Normal curves?

8) Suppose that the number of miles that an electric car battery has mean μ and standard deviation 100. Using the central limit theorem, approximate the probability that the average number of miles per battery obtained from a set of *n* batteries will differ from μ by more than 20 if:

a) n = 10 b) n = 20 c) n = 40 d) n = 100

9) A producer of cigarettes claims that the mean nicotine content in its cigarettes is 2.4 milligrams with a standard deviation of 0.2 milligrams. Assuming these figures are correct, approximate the probability that the **sample mean** of 100 randomly chosen cigarettes is:

a) Greater than 2.5 milligrams
b) Less than 2.25 milligrams

10) It is known that the standard deviation of the weight of a newborn child is 10 ounces. If we want to estimate the average weight of a newborn, how large a sample will be needed for the standard error of the estimate to be less than 3 ounces?