STAT 225 – Summer 2009
Final

Your Name: ___________________________________________
Your Instructor: ________________________________________

Your class time (circle one):

8:40  9:50  11:00  1:00

Note:

• Show your work on all questions. Unsupported work will not receive full credit.
• All answers should be in decimal form and should be exact, or to at least taken out to two decimal places.
• You are responsible for upholding the Honor Code of Purdue University. This includes protecting your work from other students.
• You are allowed the following aids: a one-page 8 ½” x 11” handwritten (in your handwriting) cheat sheet, a scientific calculator, and pencils.
• Instructors will not interpret questions for you. If you do have questions, wait until you have looked over the whole exam so that you can ask all of your questions at one time.
• You must show your student ID (upon request) and turn in your cheat sheet when you turn in your exam to your instructor.
• Turn off your cell phone before the exam begins!

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1. University A uses an alternative version of college admission test, AST, in place of SAT and ACT. A nationwide research shows that students’ scores follow a normal distribution with mean 640 and variance 625.

   a. What is the probability that a student scores higher than 700 in this test.

   b. This year, the test score of the applicants to University A ranges between 578 and 672. What is the probability a university would have this range of AST score?

   c. If the admission office decides that only 35% of the applicants will be admitted, what should be the cutoff of AST score?
2. One of the most popular foods at the 2008 Beijing Olympic Games was the Beijing roasted duck. The process of making the roasted duck is actually a business secret. Most important of all in the process is the selection of ducks which must come from a very special breed. The restaurant regularly samples from their inventory to decide whether the ducks from their suppliers meet this criteria. Use your knowledge from this course to help the quality inspector answer the following questions. (Hint, consider the ducks from supplier A and B are from two different populations)

a. During one inspection on the inventory from supplier A, the mean weight of a sample of 100 ducks is 565 grams and the supplier told you that the standard deviation of a ducks’ weight is 36 grams. Construct a 95% confidence interval for the average weight of the ducks in the inventory. Try to explain what you find to the inspector in terms of the ducks’ weight.

b. Supplier B told you that the standard deviation of their ducks’ weight is 25 grams and the inspector wants to be 95% confident that the mean duck weight is no more than 5 grams from 565 grams. Please inform her at least how many ducks she has to have in her sample.
3. A University conducts a survey by emailing a questionnaire to all the registered seniors. The estimated time to complete this questionnaire follows an Exponential distribution with $\lambda = 0.5$ hours.

   a. What is the probability that a random selected senior complete this survey within 40 minutes?

   b. Given a randomly selected student is still answering the questionnaire after 30 minutes, what is the probability that it takes him/her at least another 15 minutes to complete this questionnaire?

   c. Find and interpret the 75th percentile in the context of the problem.
4. A company sets up the following game for its spring picnic. Players select two balls at random (and without replacement) from a box that contains three blue and five red balls. Anyone who selects two blue balls wins a gift certificate. A total of 150 people play this game; let W be the number of winners.

a. What is the exact distribution of W and its parameter(s)?

b. Write an expression for P (14 \leq W \leq 16).

c. Let W* be an approximation of W. State the distribution and parameters of W* and why we can approximate.

d. Find P (14 \leq W* \leq 16).
5. The PDF for a continuous random variable $X$ is given below:

$$f(x) = \begin{cases} \frac{1}{2} \cdot x & 0 < x < 2 \\ 0 & \text{else} \end{cases}$$

a. Find the probability $x$ is greater than 1 using the PDF.

The CDF of this random variable is:

$$F(x) = \begin{cases} 0 & x < 0 \\ .25 \cdot x^2 & 0 \leq x < 2 \\ 1 & x \geq 2 \end{cases}$$

b. Find the probability $x$ is less than 1.5 given $x$ is greater than 1 using the CDF.

c. Find the 75th percentile.

6. The time it takes you to finish this final is uniformly distributed from 100 to 180 minutes.

a. What is the probability you finish in less than 2 hours?
b. If 25 people are taking this final, what is the probability exactly 10 finish in less than 2 hours?

c. How many minutes do you expect it to take you to finish the final?
7. Chips Ahoy cookies are famous for their slogan “1,000 chips delicious.” If there are not at least 1,000 chips in a box of cookies, that customer will receive free cookies for a year. Each box contains 80 cookies. The number of chips per cookie follows a Poisson distribution with an average of 13 chips.

   a. What is the probability a random box of cookies will result in a customer receiving free cookies for a year? Name the distribution and the parameters you are using.

   b. You buy 10 boxes of cookies hoping to find at least one that will have less than 1,000 chips in it. What is the probability you will not receive free cookies for a year?

8. Let C be the amount of sleep college students receive per night. C is normally distributed with a mean of 6 hours and a standard deviation of 2 hours. Let T be the amount of sleep per night these college students will receive 20 years down the road.

   a. If T=2C-3, state the distribution and the parameters of T.

   b. What is the probability that a college student 20 years from now will sleep less than the median amount of sleep they receive now?