You have 70 minutes to do 5 pages of questions. You may use a calculator (scientific or graphing) and a table of z-scores.

The questions are not in any particular order. Don't get stuck too long on one question; you may find later questions easier. In multi-part questions, the later parts often do not depend on the earlier parts; attempt them all.

Show your work and explain your answers. Use standard notation and terminology. Don't forget to check all necessary conditions, before applying a technique. If you cannot answer a question, then show as much work as you can; good work often earns partial credit.

Good luck.

1. At the start of 2000 there were 8430 FDIC-insured banks in the USA. During the seven years 2000-2006, 23 of these banks failed, at a roughly constant rate. You are a banking industry analyst at the start of 2007. You want to predict how many banks will fail in 2007.
1A. Based on the data, estimate the probability of a randomly selected bank's failing in 2007.

1B. Which techniques that we've studied might be applicable to your task? (Don't do them.)

2. African-Americans have always constituted at least 9.7% of the population of the USA. If being elected president were independent of race, then how many presidents would we expect to have, before the first African-American one?

3. The spruce budworm (SB) is an insect that eats the foliage of coniferous trees. In a 10-year study in northern Minnesota, researchers evaluated 1300 trees for whether they had SB and whether they died during the study. Here are their data.

	Died	Lived	Total
Had SB	484	495	979
Had no SB	108	213	321
Total	592	708	1300

3A. Is having SB independent of dying during the study?

3B. Do the data demonstrate that SB causes trees to die? If so, how? If not, then how would you demonstrate that it causes trees to die?

3C. While visiting your aunt and uncle in northern Minnesota you discover that a spruce tree on their property has SB. What are its chances of survival?

4. Design and solve a realistic story problem that requires you to compute a 90% confidence interval for a proportion. (Ask me, if you are unsure of whether your problem is satisfactory. You do not need to use the whole page.)

5. A survey of automobile ownership in 1688 USA households was conducted. For simplicity, only households with exactly two cars were included. In each household, Car 1 was the first car purchased or leased, and Car 2 the second. For each car, the researchers recorded whether it was of domestic or foreign make. The relative frequencies of households are as follows.

	Car 2 domestic	Car 2 foreign	Total
Car 1 domestic	0.31	0.23	0.54
Car 1 foreign	0.20	0.26	0.46
Total	0.51	0.49	1.00

5A. Is having a domestic first car independent of having a domestic second car?

5B. If we were to select a household at random, what would the expected number of domestic cars in that household be?

5C. Identify two events in this problem that are disjoint. No explanation is necessary.

5D. If we were to select 100 households at random, how many total domestic cars should we expect to see? Give an interval of reasonable values.

6. It is generally believed that nearsightedness affects about 12% of all children, including young Joshua R. Davis. A school district tests the vision of 169 incoming kindergarten children. How many would you expect to be nearsighted? With what standard deviation?