1. Two hundred draws are made at random with replacement from the box

1	2	3	4

   Someone is thinking about the difference "number of 1's in draws 1-100" - "number of 5's in draws 101-200". True or false, and explain: the standard error for the difference is $\sqrt{4^2 + 4^2}$.

2. Box A has an average of 100 and a standard deviation of 10. Box B has an average of 50 and a standard deviation of 18. Now 25 draws are made at random with replacement from Box A, and independently, 36 draws are made at random with replacment from Box B. Find the expected value and standard error for the difference between the average of the draws from Box A and the average of the draws from Box B.

3. A coin is tossed 500 times. Find the expected value and standard error for the difference between the percentage of heads in the first 400 tosses and the percentage of heads in the last 100 tosses.

4. A coin is tossed 500 times. True or false, and explain.

   (a) The standard error for the percentage of heads among the 500 tosses is 2.2 percentage points.

   (b) The standard error for the percentage of tails among the 500 tosses is 2.2 percentage points.

   (c) The standard error for the difference "percentage of heads - percentage of tails" is $\sqrt{2.2^2 + 2.2^2} \approx 3.1$ percentage points.

5. A box contains 5000 numbered tickets, which average out to 50; the standard deviation is 30. Two hundred tickets are drawn at random without replacement. True or false, and explain: the standard error for the difference between the average of the first 100 draws amd the average of the second 100 draws is approximately $\sqrt{3^2 + 3^2}$.

6. One hundred draws are made at random with replacement from box F: the average of these draws is 51 and their standard deviation is 3. Independently, 400 draws are made at random with replacement from box G: the average of these draws is 48 and their standard deviation is 8. Someone claims that both boxes have the same average. What do you think?

7. "Is the difference between two sample averages just due to chance?" To help answer this question, statisticians use a _____ hspace1cm z-test. Fill in the blanks and explain briefly.

   item In 1990 and 2004, NAEP tested the 17-year olds on mathematics as well as reading. The average score went up from 305 to 307. You may assume the NAEP took simple random samples of size 1000 in each of the two years; the standard deviation for the 1990 data was 34, and the standard deviation for the 2004 data was 27. Can the difference between the 305 and 307 be explained as chance variation?

(a) Should you make a one-sample z-test or a two-sample z-test? Why?

(b) Formulate the null and alternative hypotheses in terms of a box model. Do you need one box or two? Why? How many tickets go into each box? How many draws? Do the tickets show test score, or 0's and 1's? Why?

(c) Now answer the main question: is the difference real, or can it be explained by chance?

8. In 1970, 59]

9. A study reports that freshmen at public universities work 10.2 hours a week for pay, on average, and that standard deviation is 8.5 hours; at private universities, the average is 8.1 hours and the standard deviation is 6.9 hours. Assume these data are based on two independent simple random samples, each of size 1000. Is the difference between the averages due to chance? If not, what else might explain it?

10. A university takes a simple random sample of 132 male students and 279 female students; 41% of the men and 17% of the women report working more than 10 hours during the survey week. To find out whether the difference in percentages is statistically significant, the investigator starts by computing $z = (41 - 17)/0.048$. Is anything wrong?