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Economics 300
Summer 2010
June 23, 2010

Review Problems for Test #2

Each question will be weighted equally on the test. The test is open-book and open-notes. Bring a calculator. In order to get full credit, you must show the calculations used to arrive at your answers. Draw any diagrams clearly. Show at least two significant digits in final answers.

(1) The millions of SAT mathematics scores of the population of U.S. college-bound seniors are approximately normally distributed around a mean of 515, with a standard deviation of 116.

a. For a student drawn at random, what is the chance of a score above 600?

b. The registrar of Wisleyan University does not know the mean score of the population, and estimates it with the mean $\overline{X}$ of a random sample of 200 scores. She hopes that $\overline{X}$ will be no more than 15 points off. What are the chances of this?

(2) A congressional district contains two income classes: 80% are poor people paying an average income tax of $2000; 20% are rich people paying an average income tax of $32,000.

a. Calculate the mean tax.

b. The representative for the district records the taxes of 1000 visitors to the district office. Each rich person is three times as likely as each poor person to visit the office. Therefore, for every 80 poor people who visit, 3*20 = 60 rich people visit. What is the bias in the sample mean tax?

(3) In the end of October 1986, a Gallup poll of 1500 Americans estimated that 63% of Americans approved of President Reagan's handling of his job as President. In a similar poll taken six weeks later, following disclosure about his administration's arms deal with Iran, his approval rating had dropped to 47%.

a. Find the 95% confidence interval for the initial approval rate in October.

b. Find the 95% confidence interval for the drop in the approval rate.

(4) To evaluate whether a promotional campaign was effective, the advertising manager of a restaurant chain designed the following test. Six locations were randomly chosen. Then the computer quickly found six other locations that matched them in monthly sales, to give six matched pairs. Within each pair, one was randomly chosen for the promotional campaign for a month, while the other was left as a control. Finally, the sales in that month were carefully monitored pair by pair and were as follows (in $000s):

Promotional location	Control location
69	62
84	86
62	59
47	48
53	49
99	92

a. What is the null hypothesis? What is the alternative hypothesis?

b. Construct the 95% confidence interval for the difference that the promotional campaign makes. Can you reject the null hypothesis?

c. Calculate the p-value for H_0. At level $\alpha = 5\%$, can H_0 be rejected?

d. The sales manager suggests that the next time a test is run, six locations should be randomly chosen for the promotion, and then six more locations should be independently chosen as the controls. Would this design be more, less, or equally effective? Why?

(5) In the early 1900s, six provinces in Bavaria recorded their infant mortality (deaths per 1000 live births) and bottle-feeding (percentage of infants bottle-fed) rates:

province	mortality (deaths per 1000)	bottle feeding (%)
Mittelfranken	250	40
Niederebayern	320	70
Oberfranken	170	10
Oberpfalz	300	40
Schwaben	270	60
Unterfranken	190	20
Mean:	250	40

a. Calculate the appropriate regression line.

b. To what extent do these data prove the benefits of bottle-feeding?