Economics 250 Mid-Term Test 2
24 March 2011

Instructions: You may use a hand calculator. Do not hand in the question sheet. Answer all four questions in the answer booklet provided. Show your work. Formulas and tables are provided at the end of the question pages.

1. A training program enrols 100 people. Suppose that in the population the training leads to a job with probability 0.7 and that this outcome is independent across people.

(a) What is the probability that the sample proportion that finds a job is greater than 0.75?

(b) In fact, an investigator does not know the probability that training leads to a job but must draw inference from a sample. Suppose that in this sample 80 people find jobs. Find a 95% confidence interval for the true but unknown success rate in the population.

2. Suppose that we label the length of unemployment spells by X. A researcher studies a sample of 20 such spells and finds that the sample average is 13 weeks and the sample standard deviation is 6 weeks. The researcher uses the central limit theorem.

Find a 90% confidence interval for the average length of an unemployment spell in the population.

3. Suppose that the rate of return on a relatively safe investment is $r_1 \sim N(1, 1)$, and the rate of return on a riskier investment is $r_2 \sim N(2, 4)$, where returns are quoted and percentage points. The correlation between the two returns is 0.5. A portfolio manager invests one-third of assets in investment 1 and two-thirds of assets in investment 2.

(a) Find the mean and variance of the portfolio return.

(b) What is the probability that the return on the portfolio is greater than the average return on the first, relatively safe investment?

4. In a population of workers, suppose that the earnings of university graduates are uniformly distributed between 30 and 80 and those of non-graduates are uniformly distributed between 20 and 50. The proportion graduating from university is 30%, and so the proportion not doing so is 70%.

(a) What is the variance of income conditional on being a university graduate? (*i.e.* Find the variance for university graduates.)

(b) What is the overall mean of income in the population?

(c) If you observe that someone has an income greater than 40 then what is the probability that he or she is a university graduate?