IEOR165

University of California, Berkeley

Midterm Exam II, 2011

Name:

Student ID:

1. **[15, 10]** A major credit card company is planning a new offer for their current cardholders. The offer will give double airline miles on purchases for the next 6 months if the cardholder goes online and registers for the offer. To test the effectiveness of the campaign, the company recently sent out offers to a random sample of 50,000 cardholders. Of those, 1184 registered.

   (a) Give a 95% confidence interval for the true proportion for those cardholders who will register for the offer. Provide a justification of assumptions that need to be satisfied.

   (b) If the acceptance rate is only 2% or less, the campaign won't be worth the expense. Given the confidence interval you found, would you recommend running the campaign? Explain.

2. **[15]** In 2004, a testing company reported on the percentage of 1st year students at 4-year colleges who return for a 2nd year. Their sample of 1139 students in private colleges showed a 74.9% retention rate while the rate was 71.9% for the sample of 505 student at public colleges. Does this provide evidence that there is a difference in retention rates of 1st year students at public and private colleges? Justify the assumptions underlying the methods you use, and provide a justification of your conclusion.

3. **[30]** A tire manufacturer is considering a newly designed tread pattern for its all-weather tires. Tests have indicated that these tires will provide better gas mileage and longer tread life. The last remaining test is for braking effectiveness. The company hopes the tire will allow a car traveling at 60mph to come to a complete stop within an average of 125 feet after the brakes are applied. They will adopt the new tread pattern unless there is strong evidence that the tires do not meet this objective. The distances (in feet) for 10 stops of a rest track were 129, 128, 130, 132, 135, 123, 102, 125, 128, and 130 and are plotted in Figure 1. Should the company adopt the new tread pattern? Test an appropriate hypothesis and state your conclusion together with a recommendation for the company. Explain how you dealt with the outlier. Justify the assumptions underlying the adopted test.

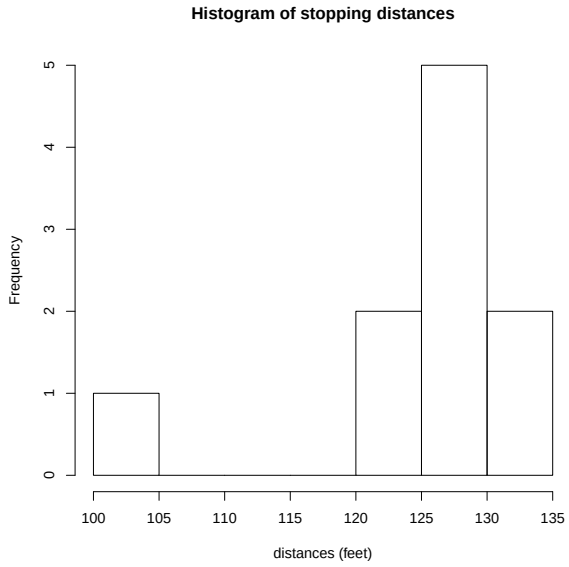

Figure 1: Histogram of stopping distances.

4. **[30]** Researchers randomly assigned participants either a tall, thin "highball" glass or a short, wide "tumbler", each of which held 355 ml. Participants were asked to pour a shot (1.5oz = 44.3 ml) into their glass. Did the shape of the glass make a difference in how much liquid they poured? A summary of the data is as follows:

   highball: $n = 99$, $\bar{y} = 42.2$ ml, $s = 16.2$ ml.

   tumbler: $n = 99$, $\bar{y} = 60.9$ ml, $s = 17.9$ ml.

   Test an appropriate hypothesis and state your conclusions. Justify the assumptions for the test. (For assumptions and conditions that can not be tested, make a note of them and assume that they are sufficiently satisfied to proceed).

A relevant formula for 2 sample t-tests/intervals:

$$d.o.f = \frac{\left(\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}\right)^2}{\frac{1}{n_1 - 1}\left(\frac{s_1^2}{n_1}\right)^2 + \frac{1}{n_2 - 1}\left(\frac{s_2^2}{n_2}\right)^2}$$

For fractional values, use tables after rounding appropriately.