ADA1, HW for chapter 7, due Thursday, Nov 15th

Instructions:

1. Clearly define population parameters in each problem. That is, give a verbal description of what the population mean is in the context of the problem.
2. Clearly specify hypotheses when appropriate (not every problem involves a test of hypothesis).
3. Write a coherent conclusion based on each CI or test.

1. A 1997 survey conducted by M.I.T. reported that 16% of the 1,014 adults surveyed would be willing to support tax hikes to find extra-terrestrials.

(a) (5 points) Find a 95% CI for the proportion p of all adults that favor such a tax hike.

(b) (5 points) Suppose it was known that in 1990 that the proportion of all adults willing to support tax hikes to find extra-terrestrials was 0.2. Is there evidence that the proportion of adults in 1997 willing to spring for tax hikes for this purpose has changed since 1990? Carry out a test to answer this question. Use $\alpha = 0.05$.

2. Prof. Ed Bedrick was involved in a study that examined the extent of side effects from using amphetamines to treat children with traumatic brain injuries. Prior information suggests that the probability of major side effects is very small, so it is of interest to estimate the maximum plausible value that the probability of major side effects might be. In the study none of the 15 children had major side effects.

(10 points) Compute an exact upper 95% confidence bound for the probability of major side effects. Write a short conclusion to your analysis, interpreting the results of the exact bound in the context of the problem.

3. The National Center for Health Statistics (NCHS) gave the following data on the distribution of suicides in the U.S. by month in 1990. Is there any evidence that the suicide rate varies monthly, or are the data consistent with

the hypothesis that the rate is constant?

(a) (10 points) To simplify your analysis, assume the months have the same numbers of days. Compare the observed proportions across months qualitatively and through a formal goodness-of-fit test. (The expected proportions will be 1/12 for each month.) Write a short and coherent summary to this problem. Make sure to include relevant graphical summaries with your presentation. The code below will create a data.frame for you to get started.

```
# read data from space delimited text
suicide <- read.table(text="
  Month  Suicides
  01Jan      1867
  02Feb      1789
  03Mar      1944
  04Apr      2094
  05May      2097
  06Jun      1981
  07Jul      1887
  08Aug      2024
  09Sep      1928
  10Oct      2032
  11Nov      1978
  12Dec      1859
", header=TRUE)
```

(b) Plot observed vs expected values to help identify months that deviate the most. Also discuss which months contribute most to the χ^2 statistic.

4. There are four major blood groups in humans: O, A, B, and AB. A sample of individuals with records at the Blood Bank of Hawaii was selected. Each individual was classified according to blood type and ethnicity. The following two-way table of counts was obtained.

```
blood <- read.table(text="
                                    Ethnicity
                 ---------------------------------------------------
 Blood_Type     Hawaiian   Hawaiian_White   Hawaiian_Chinese   White
     O            1903          4469             2206          53759
     A            2490          4671             2368          50008
     B             178           606              568          16252
    AB              99           236              243           5001
", header=TRUE, skip=3)
```

```
# reshape into matrix for chisq.test()
blood.matrix <- matrix(c(blood[,2], blood[,3], blood[,4], blood[,5]),
                  ncol = 4, byrow = FALSE,
                  dimnames = list("Blood_type" = c("O", "A", "B", "AB"),
   "Ethnicity" = c("Hawaiian", "Hawaiian_White", "Hawaiian_Chinese", "White")))
```

(a) (10 points) Make a plot showing the proportions of each blood type for each population. Do this, you could make four plots with bar plots for each, or you could make a single bar plot with side-by-side bars indicating the proportions within each population, using color to code the blood type.

(b) (10 points) Is there evidence that blood type and ethnicity are associated in Hawaii? Explain.