Stat 185 - Review problems for Exam 3

Our third exam is next Monday, November 20. Here are a few problems to get you thinking.
There's a good chance that *most* or even all of these problems will be represented on the
exam. There might be one or two more, as well.

1. Students purchased 6 bags of potato chips marked 28.3 grams. Weighing the contents
   of each bag, they found the following masses:

$$29.3 \mid 28.2 \mid 29.1 \mid 28.7 \mid 28.9 \mid 28.5$$

   (a) Perform a t-test to determine

       i. Whether we should accept the 28.3 gram measurement with a 95% level of
   confidence

       ii. A 95% confidence interval.

   (b) What is the critical value t^* for a 95% level of confidence?

2. Suppose that we'd like to compare the average incomes of chemistry professors vs
   math professors. A random sample of 12 chemistry professors found that their average
   salary was $101,479 per year with a standard deviation of $4126. A random sample
   of 10 math professors found that their average salary was $92,842 per year with a
   standard deviation of $3096.

   (a) Write down the hypothesis test.

   (b) Compute the standard error for the problem.

   (c) Compute the test statistic.

   (d) Use a t-table to find the t^*-value for a 95% level of confidence

   (e) What is the conclusion of the test?

   (f) Why shouldn't we use a normal table to compute a p value?

3. In a sample of 52 Republicans, 40 were for issue 1 and 12 against. In a sample of 79
   Democrats, 65 were for issue 1 and 14 against. Let's use this data to explore whether
   there is a genuine difference in the views of Democrats and Republicans on issue 1
   to a 95% level of confidence.

   (a) Compute the observed proportions $\hat{p}_R$ and $\hat{p}_D$, as well as the difference

$$\hat{p} = \hat{p}_D - \hat{p}_R.$$

(b) Compute the standard error.

(c) Compute the test statistic.

(d) Use a normal table to compute the p-value.

(e) State the conclusion of the test.

(f) Why was it OK to use a normal table?

4. A random sample of 18 college texts compared their local bookstore price to their amazon.com price. The data indicate that, on average, the local price minus the amazon price was $22 with standard deviation of $4. We are curious if the amazon price is generally *less* than the book store price.

(a) Write down the hypothesis test.

(b) Compute the standard error for the problem and test statistic.

(c) State what test you plan to use for this problem and why

(d) What is the conclusion of the test and what is your supporting evidence?

5. A college statistics professor expects to assign grades in the following proportions

Grade	A	B	C	D	E
Expected Percentage	10%	30 %	40%	20%	0%
Actual count	3	6	8	1	0

Perform a χ^2 test to examine whether these grade counts agree with the expected grade counts.

6. Data relating favorite outdoor activities is shown in table 1 below. Suppose I run a `chisq.test` command on this table and generate the following output:

```
Pearson's Chi-squared test
X-squared = 10.424, df = 6, p-value = 0.1079
```

(a) Draw a picture illustrating how `X-squared` and `p-value` fit together.

(b) What hypothesis statement is associated with this test?

(c) How should you interpret the p-value?

	NE	SE	NW	SW
Mountain Bike	24	52	36	37
Road Bike	32	42	38	45
Rock Climb	19	37	28	55

Table 1: Favorite outdoor activities by region