HW11 - Tests of Significance

Stat 20 & 131A, Spring 2017, Prof. Sanchez

Due Apr-21

Most of the questions in this HW involve performing a hypothesis test. When performing such a
test, please follow the following indications:

- The null should include:
  - a. a statement about chance like "the difference is due to chance"
  - b. something about the problem determining the EV like "boxes have same %".
- The alternative should be similar, like:
  - a. not due to chance
  - b. a statement about the problem specifying something like "too many reds"
- Conclusions should include:
  - a. jargon like "reject null at 5% level" or "statistically significant"
  - b. something like "doesn't seem to be chance", or "can be explained by chance".
  - c. something about the problem like "possibly something else"

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1) One hundred draws are made at random with replacement from a box. The average of the draws
is 22.7, and the SD is 10. Someone claims that the average of the box equals 20. Is this plausible?
0.5pts

2) Other things being equal,

    a) which of the following P-values is best for the null hypothesis? Explain briefly. *0.5pts*

        `0.1 of 1%`   `3%`   `17%`   `32%`

    b. Repeat, for the alternative hypothesis.

        `0.1 of 1%`   `3%`   `17%`   `32%`

3) Find the area under Student's curve with 5 degrees of freedom. *1pt*

    a. to the right of 2.02

    b. to the left of -2.02

    c. between -2.02 and 2.02

    d. to the left of 2.02

4) Several thousand measurements on a checkweight average out to 512 micrograms above a kilogram; the SD is 50 micrograms. Then, the weight is cleaned. The next 100 measurements average out to 508 micrograms above one kilogram; the SD is 52 micrograms. Apparently, the weight got 4 micrograms lighter. Or is this chance variation? (You may assume the Gauss model with no bias.) Show your work. $_{1pts}$

    a. Formulate the null and alternative hypotheses as statements about a box model.

    b. Would you estimate the SD of the box as 50 or 52 micrograms?

    c. Would you make a z-test or a t-test?

    d. Did the weight get lighter? If so, by how much?

5) With a perfectly balanced roulette wheel, in the long run, red numbers should turn up 18 times in 38. To test its wheel, one casino records the results of 3,800 plays, finding 1890 red numbers. Is that too many reds? Or chance variation? $_{1pts}$

    a. Formulate the null and alternative hypotheses as statements about a box model.

    b. The null says that the percentage of reds in the box is _____. The alternative says that the percentage of reds in the box is _____. Fill in the blanks.

    c. Compute the z and P.

    d. Were there too many reds?

6) A newspaper article says that on average, college freshmen spend 7.5 hours a week going to parties. One administrator does not believe that these figures apply at her college, which has nearly 3,000 freshmen. She takes a simple random sample of 100 freshmen, and interviews them. On average, they report 6.6 hours a wekk going to parties, and the SD is 9 hours. Is the difference between 6.6 and 7.5 real? $_{1pts}$

    a. Formulate the null and alternative hypotheses in terms of a box model.

    b. Fill in the blanks. The null says that the average of the box is _____. The alternative says that average of the box is _____.

    c. Compute the z and P.

    d. Is the difference real?

7) A consulting firm did a clinical trial on the effect of anticoagulant therapy for coronary heart disease. Eligible patients who were admitted to participating hospitals on odd days of the month were given the therapy; eligible patients who were admitted on even days were the controls. In total, there were 580 patients in the therapy group and 442 controls. An observer says, *"Since the odd-even assignment to treatment or control is objective and impartial, it is just as good as tossing a coin".* Do you agree or disagree? Explain briefly. Assume the trial was done in a month with 30 days. $_{2pts}$

8) Bookstores like education, one reason being that educated people are more likely to spend money on books. National data show the nationwide average educational level to be 13 years of schooling completed, with an SD of about 3 years, for persons age 18 and over.

A bookstore is doing a market survey in a certain county, and takes a simple random sample of 1,000 people age 18 and over. They find the average educational level to be 14 years, and the SD is 5 years. Can the difference in average educational level between the sample and the nation explained by chance variation? If not, what other explanations can you give? $_{2pts}$

9) A computer is programmed to make 100 draws at random with replacement from the following box with five tickets: `[0, 0, 0, 0, 1]`, and take their sum. It does this 144 times; the average of the 144 sums is 21.13. Choose one of the following options, and explain your reasoning. $_{1pt}$

    a. The program is working fine.

    b. Something is wrong.