

You must show all mathematical work to receive full credit for the problems. (Show how you get the answer.) You must write in complete sentences on all commentary and explanation questions.

Problem 1 (21%):

A recent study reported in the news has the following information: In the State of California, among all the legal residents that qualify to serve on a jury duty, 18% are Latinos (and this figure was relatively stable for the last 2 years).

However, checking the record, of the 3466 persons who served as jurors in the past two years, there were only 295 Latinos. This was cited as evidence of discrimination. (If there were no discrimination then there should be approximately 18% Latinos among those served as jury. But it appears to be less than 18% Latinos in the jury, but could this be attributed to pure chance?)

Formulate this as a testing hypothesis problem, and compute a P-value to support the conclusion “there is discrimination (against Latinos) in the jury selection process” and against the statement “there is no discrimination in jury selection”.

a) Formulate the hypothesis to be tested:

$$H_0 :$$
$$H_A :$$

(be sure to define any notation you used)

b) Computation of the P-value, based on the information given.

c) Conclusion (and reason) using significance level $\alpha = 0.02$.

d) Find a 99% confidence interval for the unknown p , the true proportion of Latinos in the jurys.

Problem 2 (20%):

To test if a new memory-enhancing drug is *useful or harmful* for GRE test takers, several selected students have taken the test twice, once with the drug, and once without the drug (i.e. with a corn starch pill that looks exactly like the drug). Suppose the following are their test scores with and without drug: Assume those score differences is a random sample from a normally distributed population.

	John	Bill	Jane	Lisa	Tony	Eric	Mary	Ann
With Drug	544.3	487.2	553.5	399.2	571.4	499.1	504.3	512.7
No Drug	532.1	468.2	561.1	394.6	549.8	491.5	502.9	509.7

a) Suppose we want to see if the mean of the score differences is zero or not, set up the hypothesis to be tested. (define your notation)

$$H_0 :$$

$$H_A :$$

b) Compute the P-value:

c) Conclusion (with reason) if we use a significance level $\alpha = 0.05$:

Problem 3 (21%):

To find out the soft drink market share of regular coke in a certain country, a research firm have obtained a random sample of 3024 soft drink shoppers and among them 978 bought coke.

- a) based on the information given, what is the (point) estimate of coke's market share, \hat{p} ?

- b) Construct a 95% confidence interval for the p , the true market share of coke for the population.

- c) Now construct an 85% confidence interval for the p .

- d) In the confidence interval construction, if we desire the 95% margin of error to be half a percent, how big a sample size we need (use the above information as pilot study)?

Problem 4 (18%)

Do people spent less time watching TV? In 1982 a survey interviewed 350 randomly selected persons and reported their time spent per day watching TV. The sample mean was 4.1 hours, with a standard deviation of 3.3.

A similar survey done in 1994 have interviewed 1965 randomly selected persons and reported their time spent per day watching TV. The sample mean was 2.8hours with a standard deviation of 2.0.

(a) Formulate the hypothesis to be tested.

(b) Compute the P-value.

(c) Conclusion with reason, using $\alpha = 0.04$