

Hypothesis Tests

1. Heights of males with classic congenital adrenal hyperplasia are assumed to be normally distributed with a standard deviation of 8.4 cm. A sample of 10 men with CAH has mean height of 162.8 cm. Carry out the test for the below conditions:
 - a) $H_0: \mu = 165$ $H_a: \mu < 165$
 - b) $H_0: \mu = 158$ $H_a: \mu \neq 158$

2. The weights of women in the US are assumed to be normally distributed. They have a standard deviation of 12.1 kg. The weights of 6 women are given below:
64.30 , 68.93, 74.91, 52.71, 59.70, 73.60
 - a) Store these values in variable data
 - b) Test whether the mean weight of the women in the US is 64.2 Kg

3. The annual rainfall in cm at a certain weather station over last 10 years has been as follows:
17.2, 28.1, 25.3, 26.2, 30.7, 19.2, 23.4, 27.5, 29.5, 31.6
 - a) Store the values in variable rain
 - b) Test whether the average annual rainfall has increased from its longer value of 22 cm. Mention the p value.

4. A motor company runs tests to investigate the fuel consumption of cars using a newly developed fuel additive. Sixteen cars of the same make and age are used, eight with the new additive and eight as controls. The results, in mpg over a test track, are as follows:
Control: 27.0 32.2 30.4 28.0 26.5 25.5 29.6 27.2
Additive: 31.4 29.9 33.2 34.4 32.0 28.7 26.1 30.3
Test whether variances are equal

5. Average IQ of a sample of 50 students from university A was found to be 132. For a sample of 40 students from university B it was 128. The s.d. of the IQs from the two universities were 20 and 25. Test if mean IQs of university A is greater than university B

Probability:

1. What is the probability that in selecting two cards one at a time from deck with replacement the second card is?
 - a) A face card given that first card was red
 - b) An ace, given that first card was a face card
 - c) A black jack, given that first card was red ace
2. Given that the probabilities of 3 events A, B and C occurring $P(A) = 0.35$, $P(B) = 0.45$, $P(C) = 0.2$. Assuming that A, B and C has occurred. The probability of another event X, occurring are $P(X|A) = 0.8$, $P(X|B) = 0.65$ and $P(X|C) = 0.3$. Find $P(A|X)$, $P(B|X)$ and $P(C|X)$.
3. A doctor has decided to prescribe two drugs to 200 heart patients as follows:
50 gets drug A, 50 get drug B and 100 get both. The 200 patients were chosen so that each had an 80% chance of having a heart attack if given neither drug. Drug A reduces the chances of heart attack by 35% and drug B reduces the chances by 20%. If two drugs taken together worked independently. If a randomly selected patient in the program has a heart attack, what is the probability that patients were given both drugs.
4. Given $\lambda = 4.2$, for a poison distribution, find
 - a. $P(X \leq 2)$
 - b. $P(X \geq 5)$
 - c. $P(X = 8)$
5. Given binomial distribution with $n = 30$, and $p = 0.04$ find:
 - a. $P(r = 25)$
 - b. $P(r = 3)$
 - c. $P(r = 5)$

Chi-Square Tests:

1. A brand manager is concerned that her brand's share may be unevenly distributed through out the country. In a survey in which the country was divided into four geographic regions, a random sampling of 100 consumers was surveyed, the results were:

	NE	NW	SE	SW
Purchase the brand	40	55	45	50
Do not purchase	60	45	55	50
Total	100	100	100	100

- a) Create a table in excel and import the csv.
- b) Read the csv
- c) Calculate the chi square value
- d) State the null and the alternate Hypothesis
- e) Do we accept or reject the null hypothesis?

2. Load the library MASS, access the data named "Survey". Consider columns Smoke and Exer. The Smoke column is considered to have data of student's smoking habits and Exer records the exercise level. Check whether the smoking habit is independent of the exercise or not.
3. Consider the data ChickWeight in R. Consider Diet and weight. Determine whether there is any correlation between the weight and the diet or are they independent of each other.
4. Load libraries grid and vcd. Load the data Arthritis in R. Perform a chi square test on whether the person improved on the treatment they received or not.
Columns: Treatment, Improved
 - a) What is the p-value?
 - b) What is the X-Squared value?

Show whether the treatment improved or not.