

Multi-Sample Hypothesis Testing

1. A new post-surgical treatment is being compared with a standard treatment. Seven subjects receive the new treatment, while seven others (the controls) receive the standard treatment. The recovery times, in days, are given below.

Treatment:	12	13	15	19	20	21	24
Control:	18	23	24	30	32	35	39

Can you conclude that the mean recovery time for those receiving the new treatment is less than the mean for those receiving the standard treatment?

2. A group of eight individuals with high cholesterol levels were given a new drug that was designed to lower cholesterol levels. Cholesterol levels, in mg/dL, were measured before and after treatment for each individual, with the following results:

Subject	Before	After
1	283	215
2	299	206
3	274	187
4	284	212
5	248	178
6	275	212
7	293	192
8	277	196

Can you conclude that the mean cholesterol level is reduced by more than 65 mg/dl after treatment? **** see below ****

3. Medical researchers performed a comparison of two drugs, clopidogrel and ticagrelor, which are designed to reduce the risk of heart attack or stroke in coronary patients. A total of 6676 patients were given clopidogrel, and 6732 were given ticagrelor. Of the clopidogrel patients, 668 suffered a heart attack or stroke within one year, and of the ticagrelor patients, 569 suffered a heart attack or stroke. Can you conclude that the proportion of patients suffering a heart attack or stroke is less for ticagrelor? Use the $\alpha = 0.01$ level.
4. In a series of experiments to determine the absorption rate of certain pesticides into skin, measured amounts of two pesticides were applied to several skin specimens. For pesticide A, the variance of the amounts absorbed in 6 specimens was 2.3, while for pesticide B, the variance of the amounts absorbed in 10 specimens was 0.6. Assume that for each pesticide, the amounts absorbed are a simple random sample from a normal population. Can you conclude that the standard deviation of the amount absorbed is greater than for pesticide A than for pesticide B?

5. An experiment reported in Population Science compared fuel economies for two types of diesel mini-trucks. 12 Volkswagen and 10 Toyota were tested. The 12 Volkswagen averaged 16 kilometers per liter with a standard deviation of 1.0 kilometer per liter and the 10 Toyota trucks averaged 11 kilometers per liter with a standard deviation of 0.8 kilometer per liter. Assume the distances per liter are approximately normally distributed with equal variances. Can we, with 99% confidence, say that Volkswagen averaged more miles per gallon than Toyota?
6. One of the ways in which doctors try to determine how long a single dose of pain reliever will provide relief is to measure the drug's half-life, which is the length of time it takes for one-half of the dose to be eliminated from the body. A report of the National Institutes of Health states that the standard deviation of the half-life of the pain reliever oxycodone is 1.43 hours. Assume that a sample of 25 patients is given the drug, and the sample standard deviation of the half-lives is 1.5 hours. Assume the population is normally distributed. Can you conclude that the true standard deviation is greater than the value reported by the National Institutes of Health? (Use a 0.01 level of significance)
7. The values in the table are measured maximum breadths of male Egyptian skulls from different epochs (based on data from Ancient Races of the Thebaid, by Thomson and Randall-Maciver). Changes in head shape over time suggest that interbreeding occurred with immigrant populations. Use a 0.05 significance level to test the claim that the different epochs do not all have the same mean.

4000 B.C.	1850 B.C.	150 A.D.
131	129	128
138	134	138
125	136	136
129	137	139
132	137	141
135	129	142
132	136	137
134	138	145
138	134	137

8. A coffee-dispensing machine is supposed to deliver 12 ounces of liquid into a large paper cup, but a consumer believes that the actual amount is less. As a test he plans to obtain a sample of 5 cups of the dispensed liquid and if the mean content is less than 11.5 ounces, to reject the 12-ounce claim. If the machine operates with a known standard deviation of 0.9 ounces, what is the probability that the consumer will mistakenly reject the 12-ounce claim even though the claim is true? (Assume that all conditions for inference are met.) What would be the probability of mistakenly accepting the 12 ounce claim when in fact it is false?

**** from #2 above**

Row	1	2	3
1	283	215	68
2	299	206	93
3	274	187	87
4	284	212	72
5	248	178	70
6	275	212	63
7	293	192	101
8	277	196	81
9			
10			
11			
12			
13			
14			
15			

Hypothesis Test: Mean-One Sample

Alternative Hypothesis: 2) Population Mean > Claimed Mean

Significance: 0.05

Claimed Mean: 63

Population Standard Deviation: (if known)

Use Summary Statistics Use Data

Column Containing Sample Data: 3

Evaluate Plot

Using data from column 3

Alternative Hypothesis: $\mu > \mu(\text{hyp})$

t Test

Test Statistic, t: 3.4606

Critical t: 1.8946

P-Value: 0.0053

90% Confidence interval: 70.41009 < μ < 88.33991

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