Hypotheses. z-scores and t-scores

Statistics

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DSBA 211
January 28, 2023

Seminar Overview

1. Quiz

2. z-scores and t-scores

Quiz

A factory produces components which are claimed on average to sustain a load of 30.0 kg. Assume the standard deviation is known to be $\sigma = 0.4$ kg, and that the sustained load of components is normally distributed. The factory's manager wants to carry out a test of:

$$\mathrm{H}_0 : \mu = 30.0 \quad \text{vs.} \quad \mathrm{H}_1 : \mu < 30.0$$

at the 1% significance level. Determine the sample size which is necessary for the test to have 90% power if the true mean load sustained is 29.8 kg.

Problem 1

A manufacturer of the detergent claims that the contents of boxes sold weigh on average at least 16 ounces. The distribution of weights is known to be normal with standard deviation 0.4 ounce. A random sample of sixteen boxes yielded a sample mean weigh of 15.84 ounces.

1. Test at 10% significance level the null hypothesis that the population mean weight is at least 16 ounces.
2. Find the corresponding p-value.

Problem 2

A concerned group of citizens wants to show that less than half of the voters support the President's handling of a recent crisis. Let $p =$ proportion of voters, who supports the handling of the crisis.

1. Determine H_0 and H_1.
2. If a random sample of 500 voters gives 228 in support, what does the test conclude? Use $\alpha = 0.05$. Also, evaluate p-value.

Problem 3

It is reported that the lake water contains 0.5 g of salt per 1 liter, with a standard deviation 0.1 g.

1. In order to check this statement, 20 samples of water were chosen and the mean amount of the salt in a sample of one liter was 0.57 g. Is the report of the salt content correct?
2. It was discovered later on, that in fact only 10 samples of water were chosen and other 10 measurements just duplicate the first 10. Does your conclusion change?

Problem 4

A sample of 100 females was collected from ethnic group A and a sample of 100 from ethnic group B. Each female was asked, "Did you get married before you were 19?" The following counts were obtained.

	A	B
Yes	62	29
No	38	71

1. Test for equality of two proportions against two-sided alternative. Take $\alpha = 0.05$.
2. Find a 95% confidence interval for the difference $p_A - p_B$.
3. Test hypothesis H_0: $p_A = 0.5$ against two-sided alternative. Find p-value.
4. Test hypothesis H_0: $p_B = 0.4$ against two-sided alternative. Find p-value.

Problem 5

It is claimed that an industrial safety program is effective in reducing the loss of working hours due to factory accidents. The following data are collected concerning the weekly loss of working hours due to accidents in six plants both before and after the safety program is instituted.

	Plant					
	1	2	3	4	5	6
Before	12	29	16	37	28	15
After	10	28	17	35	25	16

Does the data substantiate the claim? Use $\alpha = 0.05$.

Problem 6

A trucking firm wishes to choose between two alternative routes for transporting merchandise from one depot to another. One major concern is the travel time. In a study, 5 drivers were randomly selected from a group of 10 and assigned to route A, the other 5 to route B. The following data were obtained.

	Travel Time (hours)				
Route A	18	24	30	21	32
Route B	22	29	34	25	35

1. Is there significant difference between the mean travel times of the two routes? State the assumptions you have made while performing the test.
2. Suggest an alternative design for this study that would make a comparison more effective.

Look at the time!