Q1. A principal at a school claims that the students in his school are above average in terms of intelligence. A random sample of 30 students’ IQ scores have a mean of 112.5. The mean population IQ is 100 with STD of 15. Test the hypothesis of principal’s claim.

Ans: n=30 ,µ=100, x¯ =112.5

Zcal=(112.5-100)/(15/√30)=4.56 Zcritical=1.65

Reject → The students in school are above average

P=1-Area(Zcal)=1-.99997=.00003<0.05 , reject

Q2. The average weights of students of my class is 168 lbs. A nutritionist believes that the mean is different. She measured the weights of 36 students and found that the mean to be 169.5 lbs with a std of 3.9. AT 95% confidence, is there enough evidence to discard the null hypothesis?

µ=168, x¯=169.5, n=36,σ=3.9

Z=2.307, Zcritical=1.96 Pvalue=1-.99111=0.00889<0.05

Reject

Q3. In the population, the average IQ is 100 with a standard deviation of 15. A team of scientists want to test a new medication to see if it has either a positive or negative effect on intelligence, or not effect at all. A sample of 30 participants who have taken the medication  has a mean of 140. Did the medication affect intelligence?

µ=100, x¯=140, n=30,σ=15

Zcal=14.6

Zα=1.96 Pvalue=1-.99997=0.00003

Reject →Medication affect the index

Q4. A car manufacturer claims that the average fuel efficiency of its new model is 30 miles per gallon (mpg). To test this claim, a random sample of 35 cars is selected, and their average fuel efficiency is found to be 29.2 mpg with a standard deviation of 2.5 mpg. Perform Z-test at a 5% significance level to determine if the manufacturer's claim is supported.

µ=30, x¯=29.2, n=35,σ=2.5

Zcal=|-1.9|<1.96 , Pvalue=1-0.02872>0.05 → Fail to reject null ,so avg fuel efficiency of its new model is not 30

Q5 A company claims that their new marketing campaign will increase website traffic by at least 20%. Before the campaign, the average daily website traffic was 2,000 visitors. After the campaign, a random sample of 30 days shows an average daily traffic of 2,100 visitors with a standard deviation of 150 visitors. Perform a one-sample Z-test at a 5% significance level to determine if the claim is supported.

µ=2000, x¯=2100, n=30,σ=150

Zcal=3.65

Zcri=1.65 Pvalue=1-0.99987=0.00013

Reject null, so new marketing campaign will increase website traffic by at least 20%

Q6 A researcher wants to test if the average IQ score of a group of students is different from the national average IQ score of 100. A random sample of 40 students is taken, and their average IQ score is 102 with a standard deviation of 15. Perform a one-sample Z-test at a 1% significance level to determine if the group's average IQ score is significantly different from the national average.

µ=100, x¯=102, n=40,σ=15

Zcal=.377

Zcritical=2.56 Pvalue=1-0.62930>0.05

Fail to reject null, So the average IQ score of a group of students is not different from the national average IQ score of 100

Q7 You know that the standard deviation of IQ in the general population is 15. You test your drug on 36 patients and obtain a mean IQ of 97.65. Using an alpha value of 0.05, is this IQ significantly different than the population mean of 100?

µ=100, x¯=97.65, n=36,σ=15

Zcal=-.94

Zcal<1.96 P value=1-0.82639=0.17361>0.05

Fail to reject null, So IQ is not significantly different than the population mean of 100