

Hypothesis Testing

For the following questions: a) State the null and alternative hypotheses. b) Calculate the test statistic. c) Calculate the p-value. Sketch the normal curve. d) Decide at the 0.01 significance level and e) Interpret the decision in the context of the claim.

1. The EPA reports that the exhaust emissions for a certain car model has a normal distribution with a mean of 1.45 grams of nitrous oxide per mile and a standard deviation of 0.4. The car manufacturer claims their new process reduces the mean level of exhaust emitted for this car model. A SRS of 28 cars is taken and the mean level of exhaust emitted for this sample is 1.21 grams.
2. The amount of water consumed per week by Montana residences is normally distributed with an unknown mean μ and a standard deviation of 10 gallons. A simple random sample of ten residences has a mean value of $\bar{x} = 120.3$ gallons. The city of Bozeman claim that the average water consumed in the state of Montana is not 125 gallons.
3. A credit card company wondered whether giving frequent flyer miles for every purchase would increase card usage, which has a current mean of \$2500 per year. They gave free miles to a SRS of 51 credit card customers and found the sample mean to be \$2542. Assume the population standard deviation is $\sigma = \$109$.
4. Studies conducted in the 1970s indicated that the average age at which children take their first alcoholic drink is 14.6 years old. Sociologists believe that children are starting to drink at a younger age. A SRS of 144 young adults (18 years of age) is selected and the age at which each adult took their first alcoholic drink is recorded. The sample mean age was 13.3 years of age. The population standard deviation is known to be 5 years.