1. A particular brand and model of automobile gets 28 mpg in city driving. City traffic engineers have recently installed a computerized traffic-light system with the goal of keeping cars moving more, and thus, improving gas mileage in city driving conditions. A sample of nine cars gave a mean of 28.5 mpg and a standard deviation of 1.5 mpg. Assume that mpg for the auto mentioned above are normally distributed.

a. Use the classical approach to perform a hypothesis test at the 5% level of significance to determine if the computerized traffic system has resulted in improved gas mileage.

b. Use the P-value approach to perform a hypothesis test at the 5% level of significance to determine if the computerized traffic system has resulted in improved gas mileage.

2. Homes in a trendy college town have a mean value of $88,950. It has been assumed by many people that houses in the vicinity of the college have a higher value. To test this belief, a random sample of 11 homes is chosen from the college area. The mean is $92,400 and the standard deviation is $5200. Assume that home prices in this town are normally distributed.

a. Use the classical approach to perform a hypothesis test at the 5% level of significance to determine if houses in the vicinity of the college have a higher value.

b. Use the P-value approach to perform a hypothesis test at the 5% level of significance to determine if houses in the vicinity of the college have a higher value.
Answers

1. Classical approach

\[ H_0: \mu = 28 \]

\[ H_a: \mu > 28 \]

The critical value of \( t \) is \( t(8,.05) = 1.86 \) with a Rejection Region in the right tail.

\[ t^* = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{28.5 - 28}{1.5/\sqrt{9}} = 1 \]

This value of the test statistic lies in the Acceptance Region for \( H_0 \), so we will not reject \( H_0 \). It seems as though the new traffic-light system does not improve gas mileage.

P-value approach

\[ H_0: \mu = 28 \]

\[ H_a: \mu > 28 \]

\[ \alpha = .05 \]

\[ t^* = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{28.5 - 28}{1.5/\sqrt{9}} = 1 \]

and from table 7, the P-value is 0.173

Since this P-value is \( > \alpha \), we will not reject \( H_0 \). It seems as though the new traffic-light system does not improve gas mileage.
2. **Classical approach**

H₀: \( \mu = 88,950 \)

Hₐ: \( \mu > 88,950 \)

The critical value of \( t \) is \( t(10,.05) = 1.81 \) with a Rejection Region in the right tail.

\[
t^* = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{92,400 - 88,950}{5200/\sqrt{11}} = \frac{3450}{1567.858992} = 2.2004529 \approx 2.2
\]

This value of the test statistic lies in the Rejection Region for \( H₀ \), so we will reject \( H₀ \). It seems as though houses in the vicinity of the college do have a higher value.

**P-value approach**

H₀: \( \mu = 88,950 \)

Hₐ: \( \mu > 88,950 \)

\( \alpha = .05 \)

\[
t^* = \frac{\bar{x} - \mu}{s/\sqrt{n}} = \frac{92,400 - 88,950}{5200/\sqrt{11}} = \frac{3450}{1567.858992} = 2.2004529 \approx 2.2 \text{ and from table 7, the P-value is .026.}
\]

Since this P-value is < \( \alpha \), we will reject \( H₀ \). It seems as though houses in vicinity of the college do have a higher value.