

$$\bar{X} = 3.8$$

$$S_X = 1.6$$

$$\mu_0 = 4.0$$

$$\alpha = 5\%$$

$$n = 300$$

Population

Aquatics Paints Customers

Quantitative Variable

Preference Score for Ruby Red

Step I Identify Procedure:

We want to test the evidence against the claim that the mean for preference score for Ruby Red in the population of Aquatics Paints Customers (μ) is equal to 4.0 (μ_0).

The null and alternative hypotheses are:

$$H_0: \mu = 4.0$$

$$H_A: \mu < 4.0$$

Step II Check Conditions:

- * **Random Sample:** A random sample was conducted to insure every member of the population was equally likely to be selected.
- * **Normal Sampling Distribution:** The sampling distribution of all possible sample means has an approximately normal shape because the sample was of sufficient size, over 30 (per the Central Limit Theorem).
- * **Independence:** The lack of replacement is not a problem in this case because the number of subjects in the population is more than 10 times the sample size.

Step III Perform Procedure:

Go "Graph A" tab to see sampling distribution graph.

Sampling Distribution: Mean = 4.0

Standard Deviation =

0.09

Shape = Approximately Normal

$$\text{t-statistic} = \frac{\bar{X} - \mu_0}{\frac{S_x}{\sqrt{n}}} = \frac{3.8 - 4.0}{\frac{1.6}{\sqrt{300}}} = -2.17$$

P-Value = $P(\bar{X} < 3.8 \mid \mu = 4.0) = 1.5\%$ compared to the Significance Level (α) of 5%

Step IV Interpretation:

We reject the null hypothesis at the 5% significance level (α). The P-value of 1.5% falls well below the significance level, thus there is strong evidence that the alternative hypothesis is true, the preference score for Ruby Red in the population of Aquatics Paints Customers (μ) is less than 4.0.