Hypothesis Tests for a Population Mean

Requirements

• The sample is obtained using simple random sampling or from a randomized experiment.
• The sample has no outliers, and the population from which the sample is drawn is normally distributed or the sample size, n, is large (n ≥ 30).
• The sampled values are independent of each other.

Classical Approach (TI-83/84)
1. Write down a shortened version of claim
2. Come up with null and alternate hypothesis (H₀ always has the equals part on it)
3. See if claim matches H₀ or H₁
4. Draw the picture and split α into tail(s)
   \( H₁: \mu \neq \text{value} \) Two Tail
   \( H₁: \mu < \text{value} \) Left Tail
   \( H₁: \mu > \text{value} \) Right Tail
5. Find critical values (t-Distribution table)
6. Find test statistic (T-TEST)
7. If test statistic falls in tail, Reject H₀. If test statistic falls in main body, Accept H₀. Determine the claim based on step 3

Classical Approach (By Hand)
1. Write down a shortened version of claim
2. Come up with null and alternate hypothesis (H₀ always has the equals part on it)
3. See if claim matches H₀ or H₁
4. Draw the picture and split α into tails
   \( H₁: \mu \neq \text{value} \) Two Tail
   \( H₁: \mu < \text{value} \) Left Tail
   \( H₁: \mu > \text{value} \) Right Tail
5. Find critical values: Use t-Distribution table
6. Find test statistic:
   \[ t = \frac{x - \mu₀}{\sigma/\sqrt{n}} \]
7. If test statistic falls in tail, Reject H₀. If test statistic falls in main body, Accept H₀. Determine the claim based on step 3

Classical Approach (By Hand) (cont.)
5. Find critical values: Use t-Distribution table
6. Find test statistic: \( t = \frac{x - \mu₀}{\sigma/\sqrt{n}} \)
7. If test statistic falls in tail, Reject H₀. If test statistic falls in main body, Accept H₀. Determine the claim based on step 3

P-Value Approach (TI-83/84)
1. Write down a shortened version of claim
2. Come up with null and alternate hypothesis (H₀ always has the equals part on it)
3. See if claim matches H₀ or H₁
4. Find p-value (T-TEST)
5. If p-value is less than α, Reject H₀. If p-value is greater than α, Accept H₀. Determine the claim based on step 3
P-Value Approach (By Hand)
1. Write down a shortened version of claim
2. Come up with null and alternate hypothesis (H_0 always has the equals part on it)
3. See if claim matches H_0 or H_1
4. Find test statistic: \[ t_o = \frac{\bar{x} - \mu_o}{s / \sqrt{n}} \]

P-Value Approach (By Hand) (cont.)
5. Lookup the t-score from step 4 in the t-Distribution table and find the p-value (Remember the p value is the area JUST in the tail(s))
6. If p-value is less than \( \alpha \), Reject \( H_0 \). If p-value is greater than \( \alpha \), Accept \( H_0 \). Determine the claim based on step 3

Note
Practical significance refers to the idea that, while small differences between the statistic and parameter stated in the null hypothesis are statistically significant, the difference may not be large enough to cause concern or be considered important.

1. Claim
The mean amount of fluid in a bottle of Lens Cleaner is 59 mL. A researcher believes that the mean is actually lower than that. 15 bottles are sampled and the mean is found to be 58 mL with a standard deviation of 1.2 mL. Test the claim based on this information at \( \alpha = 0.05 \). Assume it is normally distributed.

2. Claim
The mean amount of fluid in a bottle of Lens Cleaner is 59 mL. A researcher believes that the mean is different than that. 35 bottles are sampled and the mean is found to be 63 mL with a standard deviation of 2.3 mL. Test the claim based on this information at \( \alpha = 0.01 \). Assume it is normally distributed.

3. Claim
The mean amount of fluid in a bottle of pop is 16.9 fl. oz. A researcher believes that the mean is more than that. 10 bottles are sampled resulting in the following data:

<table>
<thead>
<tr>
<th>Sample</th>
<th>16</th>
<th>16.1</th>
<th>17</th>
<th>17.5</th>
<th>17.2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>17</td>
<td>17.5</td>
<td>16.3</td>
<td>16.7</td>
<td>18.7</td>
</tr>
</tbody>
</table>

Test the claim based on this information at \( \alpha = 0.10 \). Assume it is normally distributed.