Inference for $\mu_1 - \mu_2$: Independent Samples

The table below shows the saturated fat content (in grams) of several types of pizzas sold by two national chains.

<table>
<thead>
<tr>
<th>Domingo's Brand</th>
<th>17</th>
<th>12</th>
<th>10</th>
<th>8</th>
<th>8</th>
<th>10</th>
<th>10</th>
<th>5</th>
<th>16</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>8</td>
<td>12</td>
<td>15</td>
<td>7</td>
<td>11</td>
<td>11</td>
<td>13</td>
<td>13</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Papa Jack's Brand</td>
<td>6</td>
<td>7</td>
<td>11</td>
<td>9</td>
<td>4</td>
<td>4</td>
<td>7</td>
<td>9</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

Do the two pizza chains have significantly different mean saturated fat content in their pizzas?

To answer this question let

$\mu_D = \text{mean fat content in Domingo's Brand pizzas}$

$\mu_{PJ} = \text{mean fat content in Papa Jack's Brand pizzas}$.

1. Perform a hypothesis test for $\mu_D - \mu_{PJ}$.

   a. State the appropriate null and alternative hypotheses

   b. Calculate the value of the test statistic.

   **Note:** If you have a ti83-84-89, enter the above data into the calculator and let the calculator do the work. If you do not have a ti83-84-89, for the degrees of freedom $df$ use the approximation $df \approx \min(n_1 - 1, n_2 - 1)$.

   $n_D = \quad \overline{x}_D = \quad s_D^2 =$

   $n_{PJ} = \quad \overline{x}_{PJ} = \quad s_{PJ}^2 =$

   c. Estimate the P-value and state a conclusion.

   d. What assumptions are necessary to ensure the validity of this test?
2. Construct a 95% confidence interval for the difference $\mu_D - \mu_{P.J}$.

$$\left( \bar{x}_D - \bar{x}_{P.J} \right) \pm t_{df} \sqrt{\frac{s_D^2}{n_D} + \frac{s_{P.J}^2}{n_{P.J}}}$$

3. Determine a 95% confidence interval for the mean fat content in Domingo's Brand pizzas. Do the same for Papa Jack's Brand pizzas.

4. Compare the half-widths of the 3 confidence intervals that you have calculated. Specifically, is the half-width of the interval estimating the difference in means larger than either of the individual confidence interval half-widths? Is the half-width of the interval estimating the difference in population means as large as the sum of the two individual confidence interval half-widths?