AP STATS
Chapt 23, 24, and 25 QUIZ

Name Key
Date

Directions: Show all of your work. Indicate clearly the methods you use, because you will be graded on the correctness of your methods as well as on the accuracy of your results and explanations.

Music and Memory.
1. Is it a good idea to listen to music when studying for a big test? In a study conducted by some statistics students, 62 people were randomly assigned to listen to rap music, music by Mozart, or no music while attempting to memorize objects pictured on a page. They were then asked to list all the objects they could remember. Here are summary statistics for each group:

<table>
<thead>
<tr>
<th></th>
<th>Rap</th>
<th>Mozart</th>
<th>No Music</th>
</tr>
</thead>
<tbody>
<tr>
<td>Count</td>
<td>29</td>
<td>20</td>
<td>13</td>
</tr>
<tr>
<td>Mean</td>
<td>10.72</td>
<td>10</td>
<td>12.77</td>
</tr>
<tr>
<td>SD</td>
<td>3.99</td>
<td>3.19</td>
<td>4.73</td>
</tr>
</tbody>
</table>

Does it appear that it is better to study while listening to Mozart than rap music? Test an appropriate hypothesis and state your conclusion.

\[ H_0: \mu_m - \mu_r = 0 \] or \[ \mu_m = \mu_r \]
\[ H_a: \mu_m - \mu_r > 0 \] or \[ \mu_m > \mu_r \]

Conditions:
1. Independent: Persons' responses to not affect another
2. SRS - Stated
3. Nearly Normal: Assume more than 290 people listen to rap
   Assume more than 290 people listen to Mozart
   62 people represent the population
4. Nearly Normal: Assume normal n = n = 29 < 30
   and n = 29 < 30

\[ n_{rap} = 29 < 30 \] and \[ n_{ Mozart} = 20 < 30 \]

Not met results could be suspect

Conditions met \( \rightarrow \) use t distribution
2 sample T-test

Since value 1.758 is greater than .05, we fail to reject the \( H_0 \) we have sufficient evidence that listening to Mozart yield same results as listening to Rap for this memory test.

(df = 45.88)

(suspect due to small sample)
 Chips Ahoy.

2. In 1998, as an advertising campaign, the Nabisco Company announced a "1000 Chips Challenge," claiming that every 18-ounce bag of their Chips Ahoy cookies contained at least 1000 chocolate chips. Dedicated statistics students at the Air Force Academy (no kidding) purchased some randomly selected bags of cookies and counted the chocolate chips in each. Some of their data are given below.

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1219</td>
<td>1214</td>
<td>1087</td>
<td>1200</td>
</tr>
<tr>
<td>1121</td>
<td>1325</td>
<td>1345</td>
<td>1244</td>
</tr>
<tr>
<td>1356</td>
<td>1132</td>
<td>1191</td>
<td>1270</td>
</tr>
<tr>
<td>1295</td>
<td>1135</td>
<td>1419</td>
<td>1258</td>
</tr>
</tbody>
</table>

What does this evidence say about Nabisco's claim? Test an appropriate hypothesis and state your conclusion.

- **H₀**: μ = 1000
- **Hₐ**: μ > 1000

**Conditions**
- Independence
- # of chips in one bag does not affect another

**1. SRS - Stated**

**2. 10% Condition**
Assume more than 160 bag of cookies in population

**3. Nearly Normal**
Histogram shows unimodal at most symmetric

Estimate the true mean of chocolate chips per 18-ounce bag using the information you used above.

We are 90% confident that the true mean number of chocolate chips per bag is between 1197 and 1280 chips.

In Calc. (1196.9, 1219.5)

2-tailed Test
95\% (1187.8, 1288.4)
Sex Sells.

3. Ads for many products use sexual images to try to attract attention to the product. But do these ads bring people's attention to the item that was being advertised? To investigate, a group of statistics students cut ads out of magazines. They were careful to find two ads for each of eight similar items, one with a sexual image and one without. They arranged the ads in random order and had subjects look at them for one minute. Then they asked the subjects to list as many of the products as they could remember. Their data are shown in the table.

<table>
<thead>
<tr>
<th>Subject Number</th>
<th>Ads Remembered</th>
<th>Sexual Image</th>
<th>No Sex</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>6</td>
<td></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td></td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>8</td>
<td></td>
<td>7</td>
<td>4</td>
</tr>
</tbody>
</table>

Is there evidence that the sexual images mattered? Test an appropriate hypothesis and state your conclusion.

\[ H_0 : \mu_d = 0 \]
\[ H_a : \mu_d > 0 \]

Conditions

1. Paired Data - same subject remembers ads with and without sexual images
2. SRS - ads assigned randomly to subjects
3. 10% condition - assume number of ads are less than 10% of all ads on market
4. Normal Population - the difference in number of ads is nearly normal.

Average

\[ \mu_d = \frac{d}{n} \]

where \( d \) is difference

Sexual image - No sexual image

\[ d = 1 \]

Conditions met ⇒ use \( t \)-distribution \( df = 7 \) for paired \( t \)-test

In Calculator

Sex Image \( L_1 \)
No Sex \( L_2 \)
\[ L_3 = L_1 - L_2 \]

\[ t = 1.88 \]

\[ T \)-test Data\]

\[ \mu_0 = 0 \]

List = \( L_3 \)
Freq = 1

\[ t_{\text{calc}} = 1.88 \]

Since \( P \)-value \( > 0.05 \), we fail to reject \( H_0 \). There is no sufficient evidence that the average difference between ads with sex image and not is greater than \( \mu \). No evidence that sexual