1. In a study of the effects of marijuana use, light and heavy users of marijuana were tested for memory recall, with the results given below. Use a .07 significance level to test the claim that the population of heavy marijuana smokers has a standard deviation different from that of light users.

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>𝑥</th>
<th>s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light marijuana users:</td>
<td>64</td>
<td>78.3</td>
<td>3.6</td>
</tr>
<tr>
<td>Heavy marijuana users:</td>
<td>65</td>
<td>51.3</td>
<td>4.5</td>
</tr>
</tbody>
</table>

a. State the appropriate null and alternative hypothesis for this question.

b. Find the P-Value.

c. Make an appropriate conclusion about the null and alternative hypothesis.

d. Answer the main question.
2. Cases of violent crimes are randomly selected and categorized by month, with the results shown below. Use a .05 significance level to test the claim that the rate of violent crime is the same for each month.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number Absent:</td>
<td>786</td>
<td>704</td>
<td>835</td>
<td>826</td>
<td>900</td>
<td>868</td>
<td>920</td>
<td>901</td>
<td>856</td>
<td>862</td>
<td>783</td>
<td>797</td>
</tr>
</tbody>
</table>

a. State the appropriate null and alternative hypothesis for this question.

b. Find the P-Value.

c. Make an appropriate conclusion about the null and alternative hypothesis.

d. Answer the main question.
3. Listed below are the times (in seconds) that 10 randomly chosen animated movies showed the use of tobacco and alcohol. Use a .01 significance level to test the claim that, on average, more time is devoted to showing tobacco than alcohol.

<table>
<thead>
<tr>
<th>Tobacco:</th>
<th>176</th>
<th>51</th>
<th>0</th>
<th>299</th>
<th>74</th>
<th>2</th>
<th>23</th>
<th>205</th>
<th>6</th>
<th>155</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcohol:</td>
<td>88</td>
<td>33</td>
<td>113</td>
<td>51</td>
<td>0</td>
<td>3</td>
<td>46</td>
<td>73</td>
<td>5</td>
<td>74</td>
</tr>
</tbody>
</table>

a. State the appropriate null and alternative hypothesis for this question.

b. Find the P-Value.

c. Make an appropriate conclusion about the null and alternative hypothesis.

d. Answer the main question.
4. Gallop (the polling company) ran an article on April 27\textsuperscript{th} saying, “Although U.S. registered voters are closely divided in their 2010 congressional election preferences, those who say they are ‘very enthusiastic about voting’ this year show a strong preference for the Republican Party.” This conclusion was based on a survey of 5,490 registered voters, which had the following results:

<table>
<thead>
<tr>
<th></th>
<th>Democrat</th>
<th>Republican</th>
</tr>
</thead>
<tbody>
<tr>
<td>All registered voters</td>
<td>45%</td>
<td>46%</td>
</tr>
<tr>
<td>Very enthusiastic about voting</td>
<td>37%</td>
<td>57%</td>
</tr>
</tbody>
</table>

**Question:** At the .01 significance level, can we conclude that fewer than 46\% of all registered voters favor Democrats?

a. State the appropriate null and alternative hypothesis for this question.

b. Find the P-Value.

c. Make an appropriate conclusion about the null and alternative hypothesis.

d. Answer the main question.
5. A student wonders if tall women tend to date taller men than shorter women do. She took a small survey of 6 couples and recorded the data. Does the data show a linear correlation?

| Woman: 66 64 66 65 70 65 |
| Man: 74 60 70 68 71 69 |

a. State the appropriate null and alternative hypothesis for this question.

b. Find the P-Value.

c. Make an appropriate conclusion about the null and alternative hypothesis.

d. Answer the main question.
Problem 5 continued

e. What is the highest confidence level where we can conclude there is a linear correlation?

e. Consider a man 68.4 inches tall. Using the linear regression equation, what is the best point estimate for the corresponding woman?

f. If every woman dated a man exactly 3 inches shorter than herself, what would the correlation coefficient between male and female heights be? Include enough of an explanation so it is clear you know what the *correlation coefficient* measures.
6. Many people believe that criminals who pleas guilty tend to get lighter sentences than those who are convicted in trials. The accompanying table summarizes randomly selected data for San Francisco defendants in burglary cases. All of the subjects had prior prison sentences. Use a .05 significance level to test the claim that the sentence received is independent of the plea.

<table>
<thead>
<tr>
<th></th>
<th>Guilty Plea</th>
<th>Not Guilty Plea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short prison sentence</td>
<td>392</td>
<td>58</td>
</tr>
<tr>
<td>Long prison sentence</td>
<td>564</td>
<td>14</td>
</tr>
</tbody>
</table>

a. State the appropriate null and alternative hypothesis for this question.

b. Find the P-Value.

c. Make an appropriate conclusion about the null and alternative hypothesis.

d. Answer the main question.
Extra Credit

Question: Which type of test is used in the following study? (i.e. 1-sample z, 2-sample z, etc.) Justify your answer.

Acute partial sleep deprivation increases food intake in healthy men.

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Abstract

BACKGROUND: Acute partial sleep deprivation increases plasma concentrations of ghrelin and decreases those of leptin.

OBJECTIVE: The objective was to observe modifications in energy intake and physical activity after acute partial sleep deprivation in healthy men.

DESIGN: Twelve men [age: 22 +/- 3 y; body mass index (in kg/m^2): 22.30 +/- 1.83] completed a randomized 2-condition crossover study. During the first night of each 48-h session, subjects had either approximately 8 h (from midnight to 0800) or approximately 4 h (from 0200 to 0600) of sleep. All foods consumed subsequently (jam on buttered toast for breakfast, buffet for lunch, and a free menu for dinner) were eaten ad libitum. Physical activity was recorded by an actimeter. Feelings of hunger, perceived pleasantness of the foods, desire to eat some foods, and sensation of sleepiness were also evaluated.

RESULTS: In comparison with the 8-h sleep session, subjects consumed 559 +/- 617 kcal (i.e., 22%) more energy on the day after sleep restriction (P < 0.01), and preprandial hunger was higher before breakfast (P < 0.001) and dinner (P < 0.05). No change in the perceived pleasantness of the foods or in the desire to eat the foods was observed. Physical activity from 1215 to 2015 was higher after sleep restriction than after 8 h of sleep (P < 0.01), even though the sensation of sleepiness was more marked (P < 0.01).

CONCLUSIONS: One night of reduced sleep subsequently increased food intake and, to a lesser extent, estimated physical activity-related energy expenditure in healthy men. These experimental results, if confirmed by long-term energy balance measurements, suggest that sleep restriction could be a factor that promotes obesity. This trial was registered at clinicaltrials.gov as NCT00986492.

Answer: