Problem 1

In parts (a)–(d), determine whether the samples are independent or consist of matched pairs.

a) The effectiveness of Prilosec for treating heartburn is tested by measuring gastric acid secretion in a group of patients treated with Prilosec and another group of patients given a placebo.

b) The effectiveness of Prilosec for treating heartburn is tested by measuring gastric acid secretion in a group of patients before and after the drug treatment. The data consist of the before/after measurements for each patient.

c) The accuracy of verbal responses is tested in an experiment in which subjects report their weights and they are then weighed on a physician’s scale. The data consist of the reported weight and measured weight for each subject.

d) The effect of sugar on the net weight of the contents of cans of cola is tested with a sample of cans of regular Coke and another sample of cans of diet Coke.

Problem 2

Many studies have been conducted to test the effects of marijuana use on mental abilities. In one such study, groups of light and heavy users of marijuana in college were tested for memory recall, with the results given below:

- Items sorted correctly by light marijuana users: \( n = 64, \bar{x} = 53.3, s = 3.6 \)
- Items sorted correctly by heavy marijuana users: \( n = 65, \bar{x} = 51.3, s = 4.5 \)

Use an \( \alpha = 0.01 \) significance level to test the claim that the population of heavy marijuana users has a lower mean than the light users. Should marijuana use be of concern to college students?
Problem 3

Karl Pearson, who developed many important concepts in statistics, collected crime data in 1909. Of those convicted of arson, 50 were drinkers and 43 abstained. Of those convicted of fraud, 63 were drinkers and 144 abstained. Use an $\alpha = 0.01$ significance level to test the claim that the proportion of drinkers among convicted arsonists is greater than the proportion of drinkers convicted of fraud. Does it seem reasonable that drinking might have had an effect on the type of crime?

Problem 4

The Joint Commission on Accreditation of Health-care Organizations mandated that hospitals ban smoking by 1994. In a study of the effects of this ban, subjects who smoke were randomly selected from two different populations. Among 843 smoking employees of hospitals with the smoking ban, 56 quit smoking one year after the ban. Among 703 smoking employees from workplaces without a smoking ban, 27 quit smoking a year after the ban. Is there a significant difference between the two proportions at an $\alpha = 0.05$ significance level? Does it appear that the ban had an effect on the smoking quit rate?
Problem 5

From a sample of 50 flowers, the petal lengths of iris flowers from the Seratosa class have a mean of 1.46 mm and a population standard deviation of 0.17 mm. From another sample of 50 flowers, the petal lengths of irises from the Versicolor class have a mean of 4.26 mm and a population standard deviation of 0.47 mm. Using an $\alpha = 0.05$ significance level, test the claim that the Seratosa and Versicolor irises have the same mean petal length.

Problem 6

A study was conducted to assess the effects that occur when children are exposed to cocaine before birth. Children were tested at age 4 for object assembly skill, which was described as “a task requiring visual-spatial skills related to mathematical competence.” The 190 children born to cocaine users had a mean of 7.3 and a standard deviation of 3.0. The 186 children not exposed to cocaine had a mean score of 8.2 with a standard deviation of 3.0. Use an $\alpha = 0.05$ significance level to test the claim that prenatal cocaine exposure is associated with lower scores of four-year-old children on the test of object assembly.
Problem 7

A study was conducted to investigate the effectiveness of hypnotism in reducing pain. Results for randomly selected subjects are given below:

<table>
<thead>
<tr>
<th>Subject</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before</td>
<td>6.6</td>
<td>6.5</td>
<td>9.0</td>
<td>10.3</td>
<td>11.3</td>
<td>8.1</td>
<td>6.3</td>
<td>11.6</td>
</tr>
<tr>
<td>After</td>
<td>6.8</td>
<td>2.4</td>
<td>7.4</td>
<td>8.5</td>
<td>8.1</td>
<td>6.1</td>
<td>3.4</td>
<td>2.0</td>
</tr>
</tbody>
</table>

The values are the before and after hypnosis; the measurements are in centimeters on the pain scale. Use an $\alpha = 0.05$ significance level to test the claim that the sensory measurements are lower after hypnotism. Does hypnotism appear to be effective in reducing pain?