Homework is due by 5:00 PM on the due date at your course instructor’s office. You can always hand in your homework at the end of lecture.

You may talk with others about the homework problems but please write your solutions up independently.

Please answer homework questions in complete sentences. Make sure to staple the pages of your assignment together. **Be sure to indicate your lab section on your paper.**

You will have an opportunity to get help on homework during lab.

**Reading:**
- Apr. 12 - Apr. 19 Section 7.2
- Apr. 22 - Apr. 24 Section 8.1

**Assignment:**

1. For each of the following situations, indicate whether it is a two sample problem or a matched pairs problem. Explain briefly your choice. Also indicate whether you would construct a confidence interval or perform a test of the hypothesis and explain your choice.

   (a) A study is conducted to determine whether taking an ACT preparation course improves the overall score on the ACT. A random sample of 40 high school seniors from a school district is selected. Half are assigned at random to go through an special six week ACT preparation course. The other half do nothing special for six weeks. At the end of the six weeks, the students are given the ACT. The school district would like to determine if students completing the preparation course have significantly higher ACT scores, on average, than those who did nothing special.

   (b) Over the years, the game show Jeopardy has had more male winners than female winners. One explanation for this occurrence could be a difference in the reaction times between men and women (men buzz in faster than women). A random sample of 15 previous men contestants and a random sample of 15 previous women contestants are selected and a test of reaction times is given. The show’s producers would like to determine if the mean reaction time of women is slower than the mean reaction time of men.

   (c) The effectiveness of a weight loss program that combines exercise and diet is to be evaluated. Thirty volunteers are weighed before beginning the program and re-weighed after following the program for three months. One wishes to estimate, with 95% confidence, the mean difference between the post-program and pre-program weights.

   (d) Computers are often compared by running a set of benchmark programs and recording the CPU time required to complete each program. Six benchmark programs are selected. Each program is run on two computers and the CPU times recorded. One wishes to estimate, with 98% confidence the mean difference in CPU times for the two computers.
2. A major medical center in the Northeast conducted a study looking at blood cholesterol level and heart-attack. Below are data from 16 people who had a heart attack and 20 people who did not have a heart attack.

<table>
<thead>
<tr>
<th>(1) Heart attack</th>
<th>(2) No heart attack</th>
</tr>
</thead>
<tbody>
<tr>
<td>242 186 266 206</td>
<td>182 222 192 192 238</td>
</tr>
<tr>
<td>318 294 282 234</td>
<td>198 188 166 204 182</td>
</tr>
<tr>
<td>224 276 262 360</td>
<td>178 202 164 230 186</td>
</tr>
<tr>
<td>310 280 248 258</td>
<td>162 182 218 170 200</td>
</tr>
</tbody>
</table>

(a) Is this an experiment or an observational study? Explain briefly.

(b) Compute five-number summaries for each group.

(c) Construct side-by-side box plots. Compare the two groups in terms of center and spread.

(d) Compute sample means and sample standard deviations for the two groups.

(e) Is there sufficient evidence to indicate that the mean cholesterol for people who have had a heart attack is greater than that for people who have not had a heart attack? Perform the appropriate test of hypotheses.

(f) Construct a 95% confidence interval for the difference in mean cholesterol levels.

3. As part of a study on pulse rates some participants (controls) had their pulse rate taken and asked to sit for 5 minutes. At the end of 5 minutes their pulse rates were taken again. Below are the data.

<table>
<thead>
<tr>
<th>Participant</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulse rate 1</td>
<td>86</td>
<td>71</td>
<td>90</td>
<td>68</td>
<td>71</td>
<td>68</td>
<td>74</td>
<td>70</td>
<td>78</td>
<td>69</td>
</tr>
<tr>
<td>Pulse rate 2</td>
<td>88</td>
<td>73</td>
<td>88</td>
<td>72</td>
<td>77</td>
<td>68</td>
<td>76</td>
<td>71</td>
<td>82</td>
<td>67</td>
</tr>
</tbody>
</table>

(a) Why is this matched pair data?

(b) Calculate the mean difference in pulse rates for this sample of 10 people.

(c) The standard deviation for the 10 differences in pulse rates is 2.58. Use this to test the hypothesis that the mean difference is zero against an alternative that the mean difference is not zero.