

**Part I.** (130 points) Do all calculations in Minitab. Use a word processor of your choice to write a report. Insert computer text output and graphics to support what you are saying, but you need to write something that looks like an academic paper — not a pile of computer output. Turn in a hard copy of your HW in class (i.e., don't email me your HW). Also:

1. Clearly define population parameters in each problem. That is, give a verbal description of what the population mean is in the context of the problem.
2. Clearly specify hypotheses when appropriate (not every problem involves a test of hypothesis).
3. Write a coherent conclusion based on each CI or test.

(40<sup>pts</sup>) **1. Cloud seeding:** Return to the cloud seeding problem of Homework 2. This really is a two-sample problem, although we analyzed it in HW 2 as two one-sample problems.

unseeded	seeded
1202.6	2745.6
830.1	1697.8
372.4	1656
345.5	978
321.2	703.4
244.3	489.1
163	430
147.8	334.1
95	302.8
87	274.7
81.2	274.7
68.5	255
47.3	242.5
41.1	200.7
36.6	198.6
29	129.6
28.6	119
26.3	118.3
26.1	115.3
24.4	92.4
21.7	40.6
17.3	32.7
11.5	31.4
4.9	17.5
4.9	7.7
1	4.1

40 pts

- (a) (10 pts) Carefully check the assumption of normality on the original scale using normal scores plots, and both tests discussed in class for a formal test of the normality assumption. You need to do the seeded and unseeded days separately. Describe how this analysis fits with the description of distribution you did in HW 2.
- (b) (10 pts) Repeat for the log-transformed data.
- (c) (20 pts) Compare the groups using two-sample t-procedures. Choose the most appropriate scale in which to perform this analysis.

40 pts

(30<sup>pts</sup>) **2. Acid:** Use the Acid data (from HW 2).

Acid1	A1-2	A1-3	A1-4	Acid2
0.123	0.110	0.112	0.126	0.109
0.109	0.110	0.123	0.110	0.111
0.110	0.110	0.110	0.109	0.110
0.109	0.090	0.109	0.114	0.110
0.112	0.109	0.110	0.110	0.105
0.109	0.111	0.109	0.110	0.110
0.110	0.098	0.110	0.110	0.111
0.110	0.109	0.109	0.110	0.110
0.110	0.109	0.110	0.110	0.110
0.112	0.109	0.110	0.111	0.111
0.110	0.109	0.111	0.107	0.109
0.101	0.111	0.111	0.110	0.111
0.110	0.109	0.109	0.107	0.109
0.110	0.108	0.107	*	0.112
0.110	0.110	0.120	*	0.109
0.110	0.112	0.133	*	0.109
0.106	0.111	0.107	*	0.111
0.115	0.110	0.103	*	0.110
0.111	0.111	0.111	*	0.112
0.110	0.111	0.110	*	0.112
0.107	0.107	0.122	*	0.109
0.111	0.111	0.109	*	0.110
0.110	0.112	0.108	*	0.110
0.113	0.105	0.109	*	0.109
0.109	0.109	0.109	*	0.113
0.108	0.109	0.114	*	0.108
0.109	0.110	0.107	*	0.105
0.111	0.110	0.104	*	0.110
0.104	0.109	0.110	*	0.109
0.114	0.110	0.114	*	0.109
0.110	0.104	0.107	*	0.110
0.110	0.111	0.101	*	0.110
0.110	0.110	0.111	*	0.110
0.113	0.111	0.109	*	0.104
0.114	0.109	0.110	*	0.109
0.110	0.110	0.111	*	0.110
0.110	0.111	0.110	*	0.111

30 pts

- (a) (10 pts) Check the normality assumption for both experiments as in problem 1 above.
- (b) (20 pts) Formally compare the experiments using two-sample *t*-procedures.

(60<sup>pts</sup>) **3. cAMP:** Cyclic adenosine monophosphate (cAMP) is a substance that can mediate cellular response to hormones. In a study of maturation of egg cells in the frog *Xenopus laevis*, oocytes from each of four females were divided into two batches: one batch was exposed to progesterone and the other was not. After two minutes, each batch was assayed for its cAMP content, with the results given in the table below.

Frog	cAMP (pmol/oocyte)	
	Control	Progesterone
1	6.01	5.23
2	2.28	1.21
3	1.51	1.40
4	2.12	1.38

60 pts

- (a) (10 pts) Make a histogram and box plot of the differences between the cAMP levels for the control and progesterone samples.
- (b) (20 pts) Test at the 10% level whether there is any difference in the population mean cAMP levels for batches of oocytes that are untreated versus those treated with progesterone.
- (c) (10 pts) Compute and interpret a 90% CI for the difference in population mean cAMP levels for batches of oocytes that are untreated versus those treated with progesterone.
- (d) (10 pts) Discuss any statistical assumptions that you have made in carrying out the analysis, and whether the assumptions seem reasonable.
- (e) (10 pts) Write a short summary to the problem.

90 pts