BIO 300 ASSIGNMENT #7

NOTE: This assignment is due Friday, November 5th.

1. Researchers studying the biology of ageing carried out a selection experiment in which 12 lines of *Drosophila* were established by random sampling from a base laboratory population. Six of the lines were maintained under base conditions: eggs laid by 5-day-old females were used to start the next generation, and the remaining eggs were discarded. The other six lines were selected for greater longevity: only eggs laid by 25 day-old individuals were kept and used to start the next generation. After 25 generations, the mean lifespan of flies was measured in each line. The data are listed below.

Treatment	**Lifespan, in days (line means)**
Base conditions	28.5, 36.3, 36.8, 33.6, 39.1, 35.0
Increased longevity	37.5, 44.2, 43.8, 36.1, 42.0, 40.0

   (a) Test whether selection for greater longevity increased mean lifespan of flies using the most powerful test available.
   (b) What other assumption are you making in (a)? Test this assumption. Is the assumption valid?
   (c) Compute a 95% confidence interval for the difference in lifespan between the treatments.

2. In comparing two populations on the basis of random samples, why is it advisable to use a parametric test rather than a non-parametric test, if populations are normally-distributed?

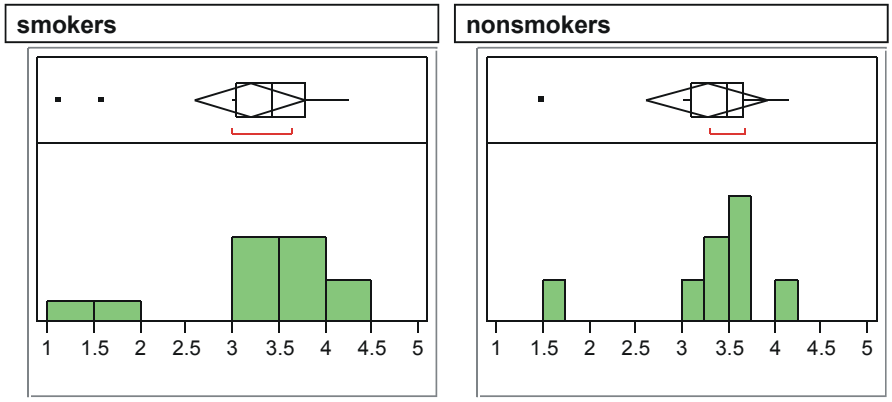
3. Researchers studying the lizard *Sceloporus occidentalis* wished to determine whether the malaria parasite *Plasmodium* would affect running performance of individual lizards. Twenty-six lizards were randomly assigned to two groups of thirteen. One group was infected with malaria, and the other group served as control. Lizards were then compared by the distance (in centimetres) they were able to run in one second.

Treatment	**Distance covered in 1 sec (cm)**
Infected	16.4, 29.4, 37.1, 23.0, 24.1, 24.5, 16.4, 29.1, 36.7, 28.7, 30.2, 21.8, 37.1
Uninfected	22.2, 34.8, 42.1, 32.9, 26.4, 30.6, 32.9, 37.5, 18.4, 27.5, 45.5, 34.0, 45.5

   Test whether or not malaria affected running speed using the most powerful test available. State all necessary assumptions.

4. A health survey compared birth weights of babies of a random sample of mothers who smoke at least 1 pack of cigarettes per day, with birth weights of babies from a random sample of non-smoking mothers. The birth weights (in kg) are given below, followed by histograms and box plots of each sample.

smokers	1.59, 1.14, 3.10, 3.30, 3.64, 3.36, 3.01, 3.83, 4.25, 3.53, 3.50, 4.15
nonsmokers	3.55, 3.03, 3.30, 3.59, 4.15, 3.69, 3.43, 1.50



(a) Based on the distribution of birth weights in the two samples, choose the most appropriate method to test whether smoking influenced birth weight. Carry out the test

(b) Is this an experimental study or an observational study? Why?

5. In a study of the effects of air pollutants on ecosystem processes, researchers grew 12 randomly sampled seedlings of sitka spruce in both of two chambers. One chamber was ozone-enriched, whereas the other chamber was free of ozone and served as the control. Chambers were otherwise identical. Each seedling was placed in one environment for two weeks, and then transferred to the other chamber for two more weeks. Chamber order for each seedling was randomized (some individuals began in the control chamber, others in the ozone-enriched chamber, decided by a coin toss). The following table records growth (in cm) of seedlings in both environments.

Seedling	Control chamber (cm)	Ozone-enriched (cm)
1	1.44	2.01
2	0.40	1.12
3	1.93	1.98
4	0.16	0.55
5	0.63	1.27
6	1.67	2.05
7	0.09	1.02
8	0.81	1.31
9	0.01	0.34
10	0.47	1.07
11	0.72	0.62
12	0.21	0.45
Mean	**0.71**	**1.15**

(a) With these data, test whether ozone influenced mean growth of seedlings. Make (and clearly state) all necessary assumptions.

(b) Compute a 95% confidence interval for the difference in mean growth between the two treatments.