## Statistics 104 — Sample Midterm

 $May\ 2015$ 

## PROBLEM 1

The table below contains bus fares in 20 different cities

1.2	1.3	1.4	1.6	1.65	1.8	1.9	2.0	2.2	2.25
2.5	2.6	2.7	2.9	3.0	3.2	4.0	5.0	8	10

(a) Calculate sample mean  $\bar{Y}$ , standard deviation s and median  $\hat{\theta}$ .

(b) Carry out a t-test of the hypothesis  $H_0: \mu = 3$  vs  $H_a: \mu < 3$ . Find the p-value and state your conclusions at  $\alpha = 0.05$ .

(c) Calculate the 95% t-interval for  $\mu$ .

(d) Test the hypothesis  $H_0: \theta = 3$  vs  $H_a: \theta < 3$  using the binomial test at  $\alpha = 0.05$ . State your conclusion.

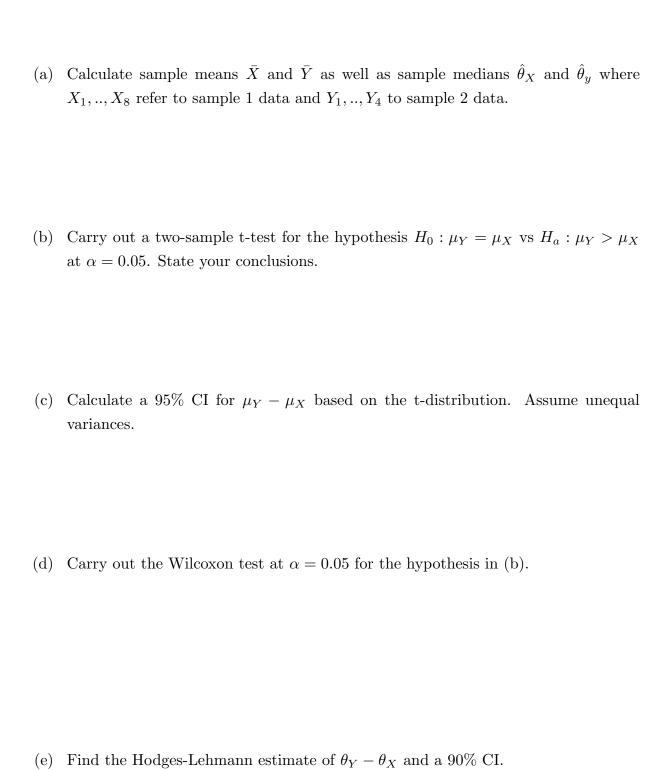
(e)	Find a 95% confidence interval for $\theta$ using the normal approximation to the binomial
	distribution.

(f) When should you use a nonparametric test and does this apply to the data in this problem?

## PROBLEM 2

The data in the following table compare reaction times (in seconds) of participants in front of a computer screen. Participants in sample 1 have been given decaffeinated coffee while sample 2 has been given regular coffee.

sample	1	2	3	4	5	6	7	8
S1	4	6	7	9	11	13	14	30
S2	5	8	10	12				



(f) Ca	alculate the	exponential	scores a	and find	the p-val	lue for	the hypot	thesis in	ı (b).
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- (f) Test the hypothesis  $H_0: \sigma_1=\sigma_2$  vs  $H_a: \sigma_1>\sigma_2$  using the the Siegel-Tukey test at  $\alpha=.05$ .
- (g) Use the Kolomogorov-Smirnov statistic to test  $H_0: F_X(x)=F_Y(x)$  vs  $H_a: F_X(x)\neq F_Y(x)$  at  $\alpha=0.05$ .

## Problem 3

(a) Restate the hypothesis  $H_0: \mu_1 = \mu_2$  vs  $H_a: \mu_1 < \mu_2$  in terms of  $F_1(x)$  and  $F_2(x)$ . Be precise in your statement.

- (b) Suppose in part (a) the alternative hypothesis is two-sided. How can this alternative be expressed in terms of  $F_1(x)$  and  $F_2(x)$ ?
- (c) Explain the difference between a skewed distribution and a heavy-tailed distribution.

(d) Calculate the power for a normal test with known variance when testing  $H_0: \mu = 0$  vs  $H_a: \mu < 0$  when the true mean is  $\mu = -5$  and the variance is  $\sigma^2 = 9$  for a sample of size n = 15 from a normal distribution. Use  $\alpha = .05$ . Calculate the power of the binomial test for this problem.

(e) Calculate the power for the binomial test with known variance when testing  $H_0$ :  $\mu = 0$  vs  $H_a$ :  $\mu < 0$  when the true mean is  $\mu = -5$  and the variance is  $\sigma^2 = 9$  for a sample of size n = 15 from a Laplace distribution. Use  $\alpha = .05$ .