THE UNIVERSITY OF SYDNEY

STAT2012 STATISTICAL TESTS

Semester 2	**Assignment 1**	2015

Important points

- In each hypothesis test, you should state the hypotheses, test statistic, assumption, p-value and conclusion.
- You should show the working.
- You are encourage to include the R outputs as checks for your answers.

1. A random sample of 10 left-handed persons is selected and the measurements on gripping strengths are shown in the following table.

Person	1	2	3	4	5	6	7	8	9	10
Left hand	140	90	125	130	95	121	85	97	131	110
Right hand	138	87	120	132	96	120	85	94	129	104
Difference	2	3	5	-2	-1	1	0	3	2	6

   (a) Test if the left-handed gripping strength is stronger than the right-handed gripping strength using t-test.

   (b) At 0.05 level of significance, find the rejection region for the sample mean for the test in (a). Draw your conclusion of the test by comparing the sample mean with the rejection region.

   (c) Find the 95% one-sided confidence interval for the true mean of differences. By comparing the hypothesized mean with the confidence interval, draw your conclusion of the test.

2. Refer to Question 1 and assume that $\sigma = 2.5$.

   (a) Find the type I and type II errors when the rejection region is $\bar{x} \geq 1.8391$ and the true mean is $\mu = 2$ under H_1.

   (b) Using the result of (a), find the Power of the test at $\mu = 2$. Comment the size of the type I error and the power of the test.

3. Refer to Question 1, test if the left-handed gripping strength is stronger than the right-handed gripping strength, using the *sign test*. Compare the result of this test with the result of a t-test.

4. Silverman *et al.* measured forced vital capacity (FVC) in six healthy adult males who were either physicans or medical research workers. The measurements were made twice, before and after certain treatment. The subjects ranged in age from 19 to 30, were nonsmokers, and had no history of chest or cardiovascular disease. The results are shown in the following table.

Subject	1	2	3	4	5	6
FVC after treatment, ml y_i	6230	5432	5023	5649	5245	5177
FVC before treatment, ml x_i	5610	4290	5555	5280	4870	4876

   (a) Test the hypothesis that there is an increase in FVC after treatment using *Wilcoxon signed rank* (WSR) test.

   (b) Calculate the approximated p-value for the WSR test in (a) when normal approximation without continuity correction is used. By comparing this approximated p-value with the exact p-value in (a), comment whether normal approximation should be used and explain briefly.

5. It is thought that regular and moderately strenuous exercise should have an effect on health. To test this contention, 16 subjects are selected and 9 of them have regular and moderately strenuous exercise. Measurements are the time (in minute) they took to reach a heart rate of 160 beats per minute while walking on a treadmill. The following sample information is collected.

Without exercise x_i	14.3	18.1	17.8	17.3	19.5	16.5	15.9		
With exercise y_i	15.5	17.7	18.2	14.7	18.1	13.2	13.8	14.9	15.8

   At 0.02 significance level, is there a *difference* in the time that people with and without exercise take to reach a heart rate of 160 beats per minute while walking on a treadmill using *two independent sample t-test*?