THE UNIVERSITY OF SYDNEY

MATH1905 STATISTICS ADVANCED

Semester 2 **Tutorial Week 10** 2012

1. A sample of size 22 from a normal population yields a total of 250 and sample variance of 2.3. Test the hypothesis that the population mean μ is 10 against the alternative that the mean is greater than 10.

2. An insurance assessor has received estimates from two different repair garages (A and B) for minor repairs on 20 cars and wants to know if there strong evidence of a difference in estimates on average.

Claim	A($)	B($)	Claim	A($)	B($)	Claim	A($)	B($)	Claim	A($)	B($)
1	48	46	6	64	54	11	80	64	16	46	64
2	56	49	7	80	52	12	58	78	17	56	54
3	87	71	8	78	88	13	72	42	18	59	50
4	88	56	9	72	82	14	60	56	19	73	61
5	86	62	10	70	80	15	64	72	20	78	70

(a) Let μ represent the true mean difference for minor repairs of this type, and set up the appropriate hypotheses.

(b) Assuming that the differences are normally distributed, perform a paired t-test. Explain why a paired test is appropriate.

(c) Check the assumption of normality by constructing a boxplot from the five number summary.

(d) Perform a test which does not assume normality. Give both the exact P value and an approximation of the P-value to 4dp using the normal approximation with continuity correction.

3. In an effort to compare the durability of two different types of sandpaper, 10 pieces of type A sandpaper were subjected to treatment by a machine which measures abrasive wear. Eleven pieces of type B sandpaper were subjected to the same treatment. Assuming normality and equality of variance, test for equality of mean abrasive wear using the following summary.

Col	Size	Mean	StDev
A	10	27.4	2.3
B	11	24.1	3.1

4. The mature heights of 12 tomato plants treated with Gro-Food once a week were compared with the heights of an independent sample of plants treated twice a week, to establish whether there is a significant difference in the mean heights under the two treatments. Use the below summary statistics to test for equality of means. Assume the height populations are normal with equal variance.

Treatments/week	Size	Mean	StDev
1	12	35.06	1.62
2	12	34.79	2.07

1. An analyst, unaware that he is being tested, is asked to make a standard measurement on each of 16 chemical samples that weigh 1.50 gm. It is suspected that he tends to over-read. His readings are:

1.50	1.53	1.54	1.48	1.49	1.50	1.51	1.51
1.52	1.53	1.51	1.50	1.52	1.51	1.53	1.52

(a) Find the mean and standard deviation of the data.

(b) Construct a box-plot to check the normal assumption.

(c) Analyse the data for evidence of over-reading using the t-test.

(d) Generate with R a random sample of size $n = 16$ from a $\mathcal{B}(7, p)$ population and transform your observations $x_1, x_2, \ldots, x_{16}$ to $y_i = (x_1 + 148)/100$, $i = 1, \ldots, 16$. Construct a box-plot to check the normal assumption and compare to your conclusion in 1(b).

2. The following results were obtained for the clotting time (in minutes) observed in 10 pairs of blood samples. One of each pair was chosen at random and treated with paraffin, the other with methacrylate.

Sample:	1	2	3	4	5	6	7	8	9	10
Paraffin:	10	27	11	18	19	16	16	18	22	26
Methacrylate:	13	20	9	12	11	14	19	12	11	18

Use a t-test to determine if the sample provides evidence that blood treated with methacrylate clots faster than blood treated with paraffin, on average.

Extra questions to try: *A Primer of Statistics:* Ch III page 120: Q 18,19.