Research Methods 2 Week 10: Exercise Sheet 1 Solution sheet

Question 1

This question applies the same technique to the technetium retention indices as was applied in the study document to the thallium indices. Clicking on on <u>Stat</u> -> <u>Basic Statistics</u> -> <u>2</u>-Sample t..., entering the column of indices in the <u>Samples</u>: box and group membership in <u>Subscripts</u>: and remembering to check the <u>Assume equal variances box</u>, gives the following in the Session window

Two-Sample T-Test and CI: Tc99, Response

Two-sample T for Tc99 Response N Mean StDev SE Mean - 14 -11.3 36.0 9.6 + 11 42.0 39.8 12 Difference = mu (-) - mu (+) Estimate for difference: -53.2 95% CI for difference: (-84.6, -21.8) T-Test of difference = 0 (vs not =): T-Value = -3.51 P-Value = 0.002 DF = 23 Both use Pooled StDev = 37.7

The sample SDs are similar, and histograms of the data are reasonable indicators of Normality in such small samples.

The P-value is 0.002. This indicates that if the mean retention index for technetium is the same among responders and non-responders, then a difference in means as large as that observed (namely -53.2%) occurs only 0.2% of the time. So, if the null hypothesis is true then the outcome of this study is a very rare event. A more rational inference is to conclude that the null hypothesis is false. The difference in means is -53.2%, and the 95% confidence interval indicates that this difference could be as large as -84.6% or as small as -21.8%.

Question 2

If the data in the question are typed into columns C1 to C3 of Minitab and the unpaired *t*-test applied in a similar way to that used in question 1 to compare first C1 with C2 and then C1 with C3, then the following outputs are obtained.

Two-Sample T-Test and CI: C1, C2

Two-sample T for C1 vs C2

N Mean StDev SE Mean C1 10 129.0 63.8 20 C2 10 120.0 72.0 23

Difference = mu Cl - mu C2 Estimate for difference: 9.0 95% CI for difference: (-54.9, 72.9) T-Test of difference = 0 (vs not =): T-Value = 0.30 P-Value = 0.771 DF = 18 Both use Pooled StDev = 68.0

MTB > TwoSample C1 C3; SUBC> Pooled.

Two-Sample T-Test and CI: C1, C3

Two-sample T for C1 vs C3

 N
 Mean
 StDev
 SE Mean

 C1
 10
 129.0
 63.8
 20

 C3
 10
 120.0
 72.0
 23

```
Difference = mu Cl - mu C3
Estimate for difference: 9.0
95% CI for difference: (-54.9, 72.9)
T-Test of difference = 0 (vs not =): T-Value = 0.30 P-Value = 0.771 DF = 18
Both use Pooled StDev = 68.0
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The outputs are identical. The results of an unpaired *t*-test are unaffected by the order in which the data are entered.

End of solution sheet