Math 10 – Homework 5 **ANSWER KEY**

Note to grader: please accept some rounding errors. E.g. using a "close enough" value in the table is fine.

Instructions

- Type your answers and paste images directly into this document.
- Or add additional space, print this out, and fill it in by hand.
- You will probably need to use a calculator for this homework.
- Print out and hand in homework in class on Tuesday.
- You may collaborate on the homework but you must write it up yourselves.

Hypothesis Testing For Difference Between Two Means

Question 1 - 15 points

Suppose we have two normally distributed populations 1 and 2, with the same unknown variance. You take two samples from them.

Sample 1	–	sample mean = 18,	sample SD = 2,	size n = 10
Sample 2	–	sample mean = 15,	sample SD = 3,	size n = 10

"Sample SD" is the estimator of the standard deviation, which is calculated using the data in the sample.

Perform a one-tailed hypothesis test at the 3% level of significance, on whether these two populations have the same population mean, or if population 1 has a larger mean.

Answers :

Null hypothesis : difference between population mean = 0 (can write mu1 – mu2 = 0 too).
Alternative : population mean 1 greater than 2. (only one-tailed tests accepted)

SE = sqrt((4+9)/10) = 1.14.
Degrees of freedom = 2(10-1) = 18.

t-statistic = (18-15)/1.14 = 2.63.
P(difference > 18 – 15 = 3) = P(T > 2.63) < P(T > 2.55) = 0.01 < 0.03.
Null rejected at 3% level of significance. Pop. 1 probably has a larger mean.

Question 2 – 15 points

Suppose we have two populations.

Population 1 – population variance = 15
Population 2 – population variance = 20

Sample 1 – sample mean = 97, size n = 20
Sample 2 – sample mean = 90, size n = 30

Perform a two-tailed hypothesis test at the 10% level of significance, on the hypothesis that population 1 and population 2 has the same population mean.

Answers:

Null hypothesis : pop. mean same (or diff. in pop mean = 0, or mu1 – mu2 = 0).
Alternative hypothesis : pop mean difference (or diff. in pop mean not 0, or mu1 – mu2 not = 0).

SE = sqrt(15/20 + 20/30) = 1.190
z-statistic = (97 – 90)/1.190 = 5.882

P(Z >= 5.882) < 0.001 for sure.

So, we reject the null at 10% level of significance. The two population probably do not have the same population mean.

Grader: they do not have to use the two-tailed p-value of 2* P(Z >= 5.882) for this course. But they should also be given full credit for doing so. Also, it is fine to call P(Z >= 5.882) the p-value for this course.