Due Wednesday, July 20, 2022 (11:59 pm)

Assigned problems

Problem 1**:** In a research report, Richard H. Weindruch of the UCLA Medical School claims that mice with an average life span of 32 months will live to be about 40 months old when 40% of the calories in their diet are replaced by vitamins and protein. Is there any reason to believe that $\mu < 40$ if 64 mice that are placed on this diet have an average life of 38 months with a standard deviation of 5.8 months? Use a P-value in your conclusion.

Sample – 64
Mean – 38 months
Deviation 5.8 months

Null hyp: the mice will live ≥ 40 months given vitamins and protein
Alt hyp: the mice will have life span < 40 months (chosen as alt bc given data tells us the lifespan avg is 32 -38 months)

Z = 38 – 40 / (5.8/sq(64)) = -2/0.725 = -2.758 -> 0.0029 -> P = 0.29%

The p value is very small, so we reject the Null Hyp and conclude that the mice will live less than 40 months.

Problem 2**:** An electrical firm manufactures light bulbs that have a lifetime that is approximately normally distributed with a mean of 800 hours and a standard deviation of 40 hours. Test the hypothesis that $\mu = 800$ hours against the alternative, $\mu \neq 800$ hours, if a random sample of 30 bulbs has an average life of 788 hours. Use a P-value in your answer.
(example 6.2)

Mean – 800 hrs
Deviation of 40 hrs
Sample – 30 has mean of 788 hrs

$H_0 = 800$
$H_1 \neq 800$

Z = 788 – 800 / 40/sq(30) = -12/ 7.3029 = -1.643 = 0.0505
Two tailed so 0.0505 * 2 = 0.101 -> P = 10.1 % > 0.05

Because the p value is greater than 5%, H_0 is plausible.

Problem 3**:** A study at the University of Colorado at Boulder shows that running increases the percent resting metabolic rate (RMR) in older women. The average RMR of 30 elderly women runners was 34.0% higher than the average RMR of 30 sedentary elderly women, and the standard deviations were reported to be 10.5 and 10.2%, respectively. Was there a significant increase in RMR of the women runners over the sedentary women? Assume the populations to be approximately normally distributed with equal variances. Use a P-value in your conclusions.

Sample 30
Deviation – 10.5
Mean – 34% higher than
30 (sedentary elder woman) with
    Deviations of 10.2

H_0 = no significant increase (runners = sedentary)
H_1 = was significant increase (runners > sedentary)

(ch.5 s6 for nearly equal variance, pg 367)

$$s_p = \sqrt{\frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}}$$

446 × 120

Top(no sq) = (30 – 1)(10.5)^2 + (30 -1) (10.2)^2 = 6214.41
Bottom(no sq) = 30 + 30 -2 = 58
Sq(top/bot) = 10.351 -> S_p

Degree of freedom – 58 round to 60
Significance (alpha) = 0.05
$T_{58,0.25} \approx 2$

-2 < 34 -0/(10.351)(sq(1/30 + 1/30)) < 2
The middle gives us 12.72 which is the test stat t

The p value < 0.00001 because it is not on the t-distribution table. (used to help check was this site: https://www.socscistatistics.com/pvalues/tdistribution.aspx
Therefore, since the P value is less than 5% we reject the H_0.