1. Some researchers have conjectured that stem-pitting disease in peach-tree seedlings might be controlled with weed and soil treatment. An experiment is conducted to compare peach-tree seedling growth when the soil and weeds are treated with one of two herbicides. In a field containing 20 seedlings, 10 are randomly selected throughout the field and assigned to receive Herbicide A. The remainder of the seedlings is assigned to receive Herbicide B. Soil and weeds for each seedling are treated with the appropriate herbicide, and at the end of the study period the height in centimeters is recorded for each seedling. The following results are obtained.

Herbicide A:

Herbicide B: X2 bar= 109.1 S2= 9

What is a 90% confidence interval (use the conservative value for the degrees of freedom) for difference of the averages?

Df = 10 -1 = 9

T\* = 1.833 based on the t table, where we find the cross of the df and confidence interval

SE = (((s1)^2 / n1) + ((s2)^2 / n2)))^1/2 = (10^2 / 10 + 9^2 / 10 )^1/2 = 4.25

Margin of error = t\* ( SE) = 4.25 \* 1.83 = 7.79

Confidence interval = x1-x2 +- Margin of error = (94.5 – 109.1) + 7.79 = -6.81

( 94.5 – 109.1) - 7.79 = -22.39

(-22.39, -6.81)

b) Suppose we wish to determine if there tends to be a difference in height for the seedlings treated with the different herbicides. To answer this question, we decide to test the hypotheses to check if there is difference between the 2 means or not.

H0 = **μ1 = u2**

**H1 = u1 != u2 t = X / SE**

**T = x / SE = 14.6 / (10^2 /10 + 9^2 / 10)^1/2 = t = 3.43 pvalue = 2(pTa > 3.43) = 0.0119**

If the significance value is 0.05, then the p value which is 0.0119, and since the p value is less than the significance value, we can reject the null hypothesis and go with the alternative that both herbicides A and B aren’t equivalent but they have a difference between each other

1. Can a six-month exercise program increase the total body bone mineral content (TBBMC) of young women? A team of researchers is planning a study to examine this question. Based on the results, they are willing to assume that 𝜎 = 2 for the percent change in TBBMC over the six-month period.  
   They also believe that a change in TBBMC of 1% is important, so they would like to have a reasonable chance of detecting a change this large or larger. Assume a sample of 25 subjects is taken and a 5% test of significance. Calculate the power of this test.

Step 1:

H0 = **μ = 0 = no change**

**Ha = μ > 0 μa = 1 = some change**

n = 25 x=0.05

r=2

z\* = 1.645

Step 2(Under the null assumption, find the related original x

X = **μ + z\* \* σ / (n)^1/2 = 0 + 1.645 \* 2 / (25)^1/2 = 0.658**

**Step 3: x from step 2 and μa to find the power**

**P(x > 0.658) z = x- μa / σ/(n)^1/2 = = (0.658 – 1) / (2 / 25^1/2) = -0.855**

P(z > **(0.658 – 1) / (2 / 25^1/2) )= -0.855**

P(z > -0.86) = 1 – 0.1949) = 0.8051

1. In a completely randomized design, seven experimental units were used for each of the five levels of the factor. (Hint: n=35) a) Complete the following ANOVA table.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Source of Variation | SS | df | MS | F | P value |
| Groups | 300 | 5-1=4 | 300/4=75 | 14.53 | 0 |
| Error | 460-300 = 160 | 35-4=31 | 160/31= 5.16 |  |  |
| Total | 460 | 35-1=34 |  |  |  |

N=35 is the total number, k = 5 is the number of level of factor, SSB is the sum of the squares between groups,SSW is the sum of the square within groups, SST is the total sum of squares, and p is the p value of the anova test

b) What hypotheses are implied in this problem?

The null hypothesis(HO) is that the means of all levels of the factor are equal

The Alternative Hypothesis(H1) is at least one mean is different from the others

c)What is the p-value associated with this ANOVA test? d)Interpret the conclusion of the test in the context of the problem.

c. Thr p value that is associated with this test is 0, which shows that there is strong evidence against the null hypothesis

d. The conclusion in the context of the problem is that there is a significant and huge variabuility among the means of the five leves of the factor at least one mean is different from the others, rejecting the null hypothesis that all means are equal, which shows that the factor being studied has a significant effect on the response variable.