Minitab work

Science, Statistics

QUESTION Data were collected from 92 villages in Gujarat, on the number of cattle in each village. This data are available in worksheet india. mtw obtainable from As1f blackboard documents.

i) Calculate the mean number of male cattle

The mean number of male cattle is 192. 6.

ii) Calculate the mean number of female cattle and its 90%confidence interval.

The mean number of female cattle is 191. 1. The 90% confidence interval for population mean number of cattle is between 171. 9 and 210. 3.

iii)in a previous census, the mean number of female cattle per village was found to be 180. Test the hypothesis that the mean you have calculated has not changed from what it was in this census. To three decimal places, what is the p-Value from the test? Is this significant at 5%level? Is there evidence to suggest that mean has changed?

The null and alternate hypotheses are

The selected level of significance, α is 0. 05.

t distribution will be used as population standard deviation, σ is unknown.

Using Minitab, the value of test statistic and p-value are

t(91) = 0. 96

p-value (two-tailed)= 0. 341(Not significant at 5% level)

Decision: Fail to reject H0, as p-value = 0. 341 > . 05

There is not enough evidence to suggest that the mean number of female cattle per village has changed from 180.

iv) Perform a hypothesis test to see whether the mean number of male cattle is equal to the mean number of female cattle. To three decimal places, what is the p value from the test? Is there evidence to reject the null hypothesis of no difference in means at the 5% significance level? Report your conclusion clearly.

The null and alternate hypotheses are

The selected level of significance, α is 0. 05.

t distribution will be used as population standard deviation, σ are unknown.

Using Minitab, the value of test statistic and p-value are

t(180) = 0. 10

p-value (two-tailed)= 0. 923

Decision: Fail to reject H0, as p-value = 0. 923 > . 05

Thus, there is not enough evidence to reject the null hypothesis of no difference in means at the 5% significance level.

In conclusion, the mean number of male cattle is not significantly different from the mean number of female cattle.

QUESTION 2

In an experiment to investigate the effect of fertiliser on mean yield of an arable crop, 20 different plots were used. Fertiliser A was applied to 10 randomly plot and B was applied to the remaining plots . After a specified time, the yield (in coded units) for each plot was measured giving the following data

Plot 1 2 3 4 5 6 7 8 9 10

Fertiliser A15 9 18 12 11 22 18 12 15 19

Fertliser B14 7 19 19 12 23 20 18 18 21

i)Perform an F test to see whether assumption of equal variances in the two fertiliser yield group is reasonable . To three decimal places, what is the p value from this F test? is it reasonable to assume that the two fertiliser yields have equal variance

The null and alternate hypotheses are

The selected level of significance, α is 0. 05.

F distribution will be used.

Using Minitab, the value of test statistic and p-value are

F(9, 9) = 0. 75

p-value= 0. 670

Decision: Fail to reject H0, as p-value = 0. 670 > . 05

Thus, it is reasonable to assume that the two fertiliser yields have equal variance.

ii)Assuming that the F test suggest that we can pool the variances , perform a hypothesis test to test whether there is significant difference in fertiliser mean yields (using a two sample t test with pooled variance). What is the value of the t-statistic? What is the value of the pooled variance used in this test ? To three decimal places, what is the p value from the test? Is there evidence to reject the null hypothesis of no difference in means at 5% significance level?

The null and alternate hypotheses are

The selected level of significance, α is 0. 05.

t distribution will be used as population standard deviation, σ are unknown.

Using Minitab, the value of test statistic (assuming equal variances) and p-value are

t(18) = -1. 00

p-value (two-tailed)= 0. 329

The value of the pooled variance is 19. 878.

Decision: Fail to reject H0, as p-value = 0. 329 > . 05

Thus, there is not enough evidence to reject the null hypothesis of no difference in means at the 5% significance level.

In conclusion, there is significant difference in fertiliser mean yields.

iii)Suppose that instead of the data arising from 20 different plots, there were in fact only 10 plots , each of which was divided into 2 subplots. For each plot, Fertliser A was applied to randomly selected subplot and fertiliser B was applied to other subplot.

Perform an appropriate hypothesis test to see whether there is evidence that the average difference between the yield from Fertiliser A and B is not zero .

To three decimal places, what is the p value from the test? Is there evidence to reject the null hypothesis that the average of the differences is zero, t the 5%signifcance level?

The null and alternate hypotheses are

The selected level of significance, α is 0. 05.

t distribution will be used as population standard deviation, σ are unknown.

Using Minitab, the value of test statistic and p-value are

t(9) = -2. 27

p-value (two-tailed)= 0. 050

Decision: Reject H0, as p-value = 0. 050

Thus, there is enough evidence to reject the null hypothesis that the average of the differences is zero, at the 5%signifcance level.

In conclusion, there is enough evidence that the average difference between the yield from Fertiliser A and B is not zero.

Question 3

Condition ‘ x’ is a medical condition from which 70% of people recover within 7 days if left untreated. The health service would like to increase this proportion by treating sufferers . An experiment was, therefore, conducted to test a new drug for treating the condition. A total of 76 patients were given the new drug, and after 7 days, 64 of them recovered.

i) Estimate the proportion of treated patients who will have recovered in 7 days, and its 95 % confidence intervals

An estimate of the proportion of treated patients who will have recovered in 7 days is about 0. 8421.

Since x = 64 and n – x = 76 – 64 = 12, each > 5, thus, condition for using the normal approximation is met.

The 95 % confidence intervals for the population proportion of treated patients who will have recovered in 7 days is between 0. 7601 and 0. 9241.

ii) Test whether the drugs leads to a significantly improved recovery rate. What is the p value of your test to three decimal places? Is there evidence to suggest that the drug improves the recovery rate compared with that for untreated individuals?

The null and alternate hypotheses are

The selected level of significance, α is 0. 05.

Since x = 64 and n – x = 76 – 64 = 12, each > 5, thus, condition for using the normal approximation is met. Therefore, z distribution will be used.

Using Minitab, the value of test statistic and p-value are

z = 2. 27

p-value (right-tailed)= 0. 003

Decision: Reject H0, as p-value = 0. 003 < . 05.

Thus, there is enough evidence to suggest that the drug improves the recovery rate compared with that for untreated individuals. In other words, the drugs leads to a significantly improved recovery rate.

MAKE SURE THAT YOU USE THE NORMAL APPROXIMATION BASED ON CENTRAL LIMIT THEREOM FOR BOTH PARTS OF THIS QUESTION