

P452 - Assignment 3

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Question-4

Students t-Test

The students t-Test has been done and the results has been tabulated in the table.

| Calculations for the Significance test | Focal Length | |
|---|--------------|------------|
| | Shipment A | Shipment B |
| | 4.65 | 4.75 |
| | 4.84 | 4.79 |
| | 4.59 | 4.74 |
| | 4.75 | 4.74 |
| | 4.63 | 4.77 |
| | 4.75 | 4.58 |
| | 4.58 | 4.81 |
| | 4.82 | |
| | 4.86 | |
| | 4.6 | |
| | 4.77 | |
| | 4.65 | |
| | 4.8 | |
| Mean | 4.714615 | 4.740000 |
| St Dev | 0.101293 | 0.075277 |
| Variance | 0.010260 | 0.005667 |
| n | 13.000000 | 7.000000 |
| t-Value | 0.634858601 | |
| t-test prob | 0.569400 | |
| F-Value | 1.810633484 | |
| Q-Value | 0.480426 | |

From the table we can see that the obtained probability is 0.5694 and the t-value is 0.6348. And the degree of freedom is $dof = 13 + 7 - 2 = 18$.

Now if we consider the $\alpha = 0.05$, from the t-table we can see that the corresponding value of t from the table for the $dof = 18$ is 2.101. The table used can be accessed by [clicking here](#). Since the value of our t is much less than the t_{crit} in the t-table, we can say the Null hypothesis: There is no significant difference between the 2 data sets is accepted. Which means that the 2 data are from the same population.

F-Test

From the table we can see that the F-Value of our data is 1.81 and the Q- Value at degree of freedoms 13-1 and 7-1, that is $Q(1.81, 12, 6)$ is 2.9 obtained from the table from [here](#). This value of Q is for $\alpha = 0.1$. So, at this level, the rejection region is $[2.9, \infty]$. So, we can reject that at 0.1 significance the Null hypothesis that the 2 variances are equal is rejected hence $\sigma_A > \sigma_B$.

Question-3

The Grades have been divided into equal bins of width 1 with grade C at the center. The calculations of the same are shown in the table below. From the table we can see that

| x-point | Grades | Unbiased Distribution f(x) | Expected Frequency Nf(x) | Observed Frequency | |
|-------------------|--------|-------------------------------|-----------------------------|-----------------------|-----------|
| 2 | A | 0.0540 | 32.3946 | 77.0000 | 61.4190 |
| 1 | B | 0.2420 | 145.1824 | 150.0000 | 0.1599 |
| 0 | C | 0.3989 | 239.3654 | 210.0000 | 3.6025 |
| 1 | D | 0.2420 | 145.1824 | 125.0000 | 2.8056 |
| 2 | E | 0.0540 | 32.3946 | 38.0000 | 0.9699 |
| chi Square | | | | | 68.957017 |

The χ^2 value was obtained to be 68.95 for 4 degrees of freedom. So, from the χ^2 -table, the critical value of the χ^2 is 9.49 @ 5% Level of significance and 7.78 @ 10% Significance. So, the observed χ^2 is much greater than both of the critical value. So, we have enough evidence to reject the hypothesis and say that the results are biased.