

# 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, at 0.1 significance the Null hypothesis that the 2 variances are equal cannot be rejected, hence  $\sigma_A = \sigma_B$ , this can be said with 90% confidence.

### 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 N*f(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  $\chi^2$  value was obtained to be 68.95 for 4 degrees of freedom. So, from the  $\chi^2$ -table, the critical value of the  $\chi^2$  is 9.49 @ 5% Level of significance and 7.78 @ 10% Significance. So, the observed  $\chi^2$  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.