

## Chisquare test / goodness of fit test

Q. 12% of people are left handed. To verify this theory you took a sample of 75 students, 11 are left handed.  $\alpha = 5\%$ . 12% of 75 = 9

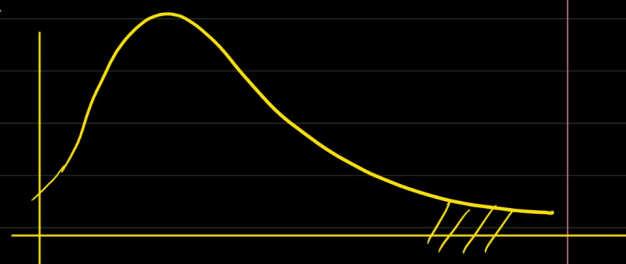
	Observed	Expected
Left	11	9
Right	64	66

Step 1 -  $H_0: M = 12\%$ ,  $H_A: M \neq 12\%$

Step 2 - 5%, Chisquare dist<sup>n</sup>  $\rightarrow$  1 tail test

Step 3  $\chi^2 \text{ statistic} = \sum \frac{(O-E)^2}{E}$

$$\chi^2_{\text{stats}} = \frac{(11-9)^2}{9} + \frac{(64-66)^2}{66} = \frac{2^2}{9} + \frac{2^2}{66} = 0.505.$$



Step 4  $\chi^2_{\text{critical}}$  for  $\alpha = 0.05$ ,

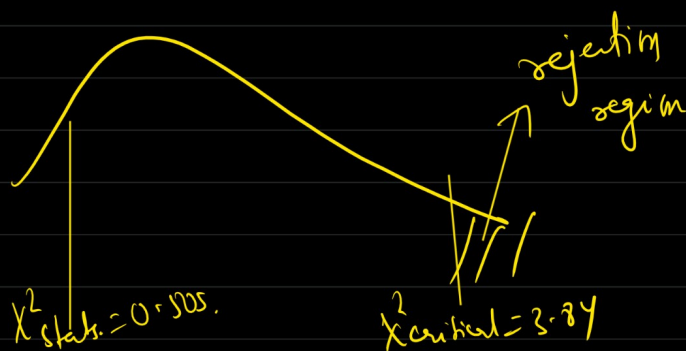
$$\begin{aligned} \text{dof} &= \text{No. of groups} - 1 \\ &= 2 - 1 \\ &= 1. \end{aligned}$$

Step 5 Conclusion

If  $\chi^2_{\text{stats}} > \chi^2_{\text{critical}}$   
reject the  $H_0$ .

$$0.505 < 3.84$$

We fail to reject the  $H_0$ .



Conclusion - 12% of people are left handed  
with 95% confidence.

Q In 2010 Census of the city, the weight of people in a city were found to be following:-

$< 50\text{kg}$	$50-75\text{kg}$	$> 75\text{kg}$
20%	30%	50%

In 2020, weight of 500 people we sampled

$< 50$	$50-75$	$> 75$
140	160	200

Using  $\alpha = 0.05$ , Can you conclude the population difference of weight has changed in last 10 years or not?

→ 2010 - 

$< 50$	$50-75$	$> 75$
20%	30%	50%

 } theoretical/expected  
in %age

2020  
 $n=500$  observed

$< 50$	$50-75$	$> 75$
140	160	200

Expected 

$< 50$	$50-75$	$> 75$
$0.2 \times 500$	$0.3 \times 500$	$0.5 \times 500$
$= 100$	$150$	$250$

Step-1  $H_0$ : The data is as per expectation  
 $H_a$ : The data is not as per expectation

Step-2  $\alpha = 0.05$

Step-3  $\chi^2_{\text{stats}} = \sum \frac{(O-E)^2}{E} = \frac{(140-100)^2}{100} + \frac{(160-150)^2}{150} + \frac{(200-250)^2}{250}$

$$= \frac{1600}{100} + \frac{100}{150} + \frac{2500}{250}$$

$$= 16 + 0.66 + 10 = 26.66$$

Step 4  $\chi^2_{\text{critical}} \alpha = 0.05$

$$\text{dof} = 3 - 1 = 2$$

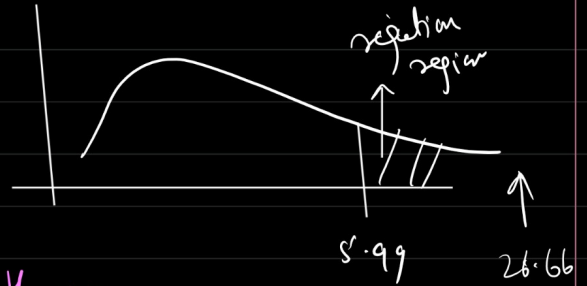
$$\chi^2_{\text{critical } 0.05, \text{ dof } 2} = \underline{5.99}$$

Step 5

$\chi^2_{\text{stats}} > \chi^2_{\text{critical}} \longrightarrow \text{Reject the } H_0$

$$26.66 > 5.99$$

reject the  $H_0$



Conclusion - The weight of 2020 population are different those expected in 2010 population.