

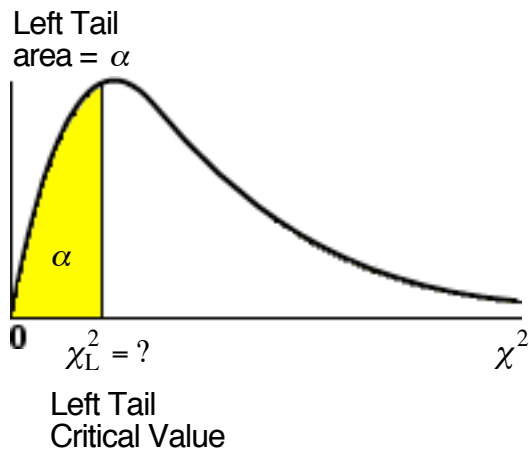
Finding Critical Values for a Chi-Square χ^2 Distribution

The entire area that is to be used in the tail(s) denoted by α . The entire area denoted by α can be placed in the **left tail** and produce a **Left Tail χ^2 Critical Value**. The entire area denoted by α can be placed in the **right tail** and produce a **Right Tail χ^2 Critical Value**. The entire area denoted by α can be split in half, denoted by $\alpha/2$, and an area of $\alpha/2$ can be placed in both the **left tail** and the **right tail**. This will produce both a **Left Tail χ^2 Critical Value** and a **Right Tail χ^2 Critical Value**.

The **Critical Value for a Chi-Square χ^2 Distribution** is a χ^2 value on the χ^2 axis that is the vertical boundary **separating the area in one tail of the graph from the remaining area**.

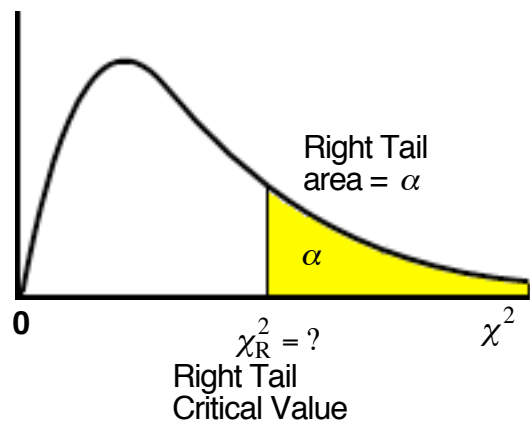
Left Tail Critical t Value

The entire area denoted by α is in the left tail.
The left tail critical value is the χ^2_L score that has an area of α to the left of the χ^2_L value.



Right Tail Critical t Value

The entire area denoted by α is in the right tail.
The right tail critical value is the χ^2_R score that has an area of α to the right of the χ^2_R value.



Two Tail Critical χ^2 Values

The area denoted by α is split in half, denoted by $\alpha/2$, and an area of $\alpha/2$ is placed in both the **left tail** and the **right tail**. This will produce both a **Left Tail χ_L^2 Critical Value** and a **Right Tail χ_R^2 Critical Value**.

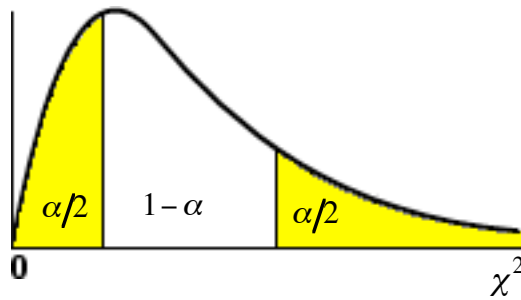
Left Tail Critical Area

The left tail has an area of $\alpha/2$

Right Tail Critical Area

The right tail has an area of $\alpha/2$

The remaining area between the two tails is $1 - \alpha$

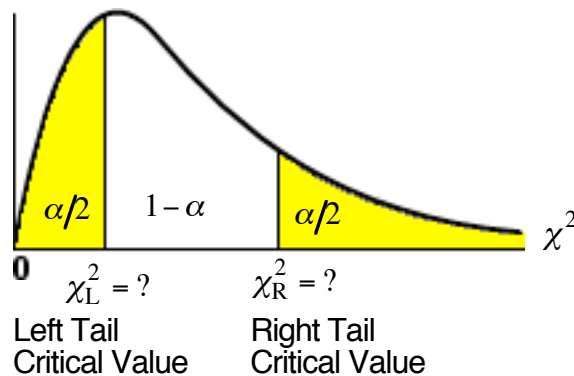


Left Tail Critical Value

The left tail critical value is the χ_L^2 score that has an area of $\alpha/2$ to the left of the χ_L^2 value.

Right Tail Critical Value

The right tail critical value is the χ_R^2 score that has an area of $\alpha/2$ to the left of the χ_R^2 value.



Note: In a two tail graph the left tail area and the right tail area both have a value of $\alpha/2$. The two tail areas do not look equal because the distribution is not normal. It is skewed left causing the tails with equal area to look different. The left tail is tall and narrow and the right tail is short and wide. In fact the right tail continues indefinitely without end.

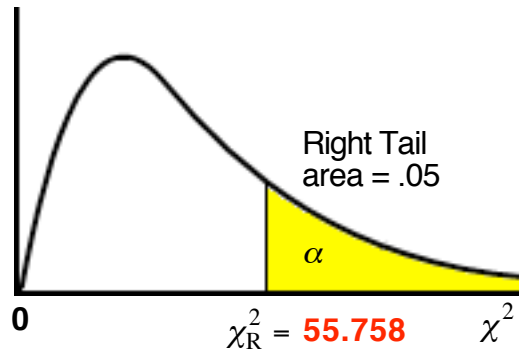
Chi-Square Distribution: Critical Values										
Deg. of	Area in the Right Tail									
Freedom	0.995	0.99	0.975	0.95	0.9	0.10	0.05	0.025	0.01	0.005
1	0.000	0.000	0.001	0.004	0.016	2.706	3.841	5.024	6.635	7.879
2	0.010	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210	10.597
3	0.072	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345	12.838
4	0.207	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.277	14.860
5	0.412	0.554	0.831	1.145	1.610	9.236	11.070	12.832	15.086	16.750
6	0.676	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812	18.548
7	0.989	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475	20.278
8	1.344	1.647	2.180	2.733	3.490	13.362	15.507	17.535	20.090	21.955
9	1.735	2.088	2.700	3.325	4.168	14.684	16.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.940	4.865	15.987	18.307	20.483	23.209	25.188
11	2.603	3.053	3.816	4.575	5.578	17.275	19.675	21.920	24.725	26.757
12	3.074	3.571	4.404	5.226	6.304	18.549	21.026	23.337	26.217	28.300
13	3.565	4.107	5.009	5.892	7.042	19.812	22.362	24.736	27.688	29.819
14	4.075	4.660	5.629	6.571	7.790	21.064	23.685	26.119	29.141	31.319
This is only a portion of the entire Chi-Square Table										

**Finding The Right Tail χ^2_R Critical Value for the χ^2 Distribution
for a One Tail (Right Tail) Hypothesis Test**

Example 1

Find the Critical χ^2_R Value for an area of $\alpha = .05$ in the **right tail** and $n = 41$

If $n = 41$ then the Degrees of Freedom = $n - 1 = 41 - 1 = 40$



If the area in the right tail is **0.05** for DF = **40** then then $\chi^2_R = 55.758$

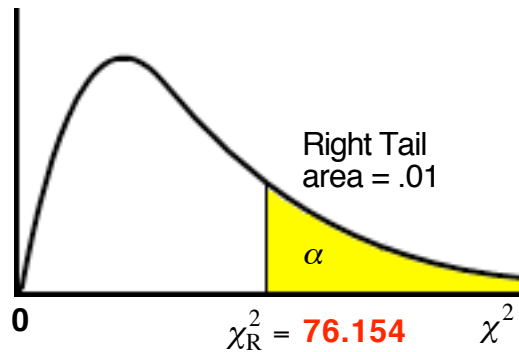
Chi-Square Distribution: Critical Values										
	Area in the Right Tail									
D of F	0.995	0.99	0.975	0.95	0.9	0.10	0.05	0.025	0.01	0.005
40	20.707	21.164	24.433	26.509	29.051	51.805	55.758	59.342	63.691	66.766

Finding The Right Tail χ_R^2 Critical Value for the χ^2 Distribution for a One Tail (Right Tail) Hypothesis Test

Example 2

Find the Critical χ_R^2 Value for an area of $\alpha = .01$ in the **right tail** and $n = 51$

If $n = 51$ then the Degrees of Freedom = $n - 1 = 51 - 1 = 50$



If the area in the right tail is **0.01** for DF = **50** then then $\chi_R^2 = 76.154$

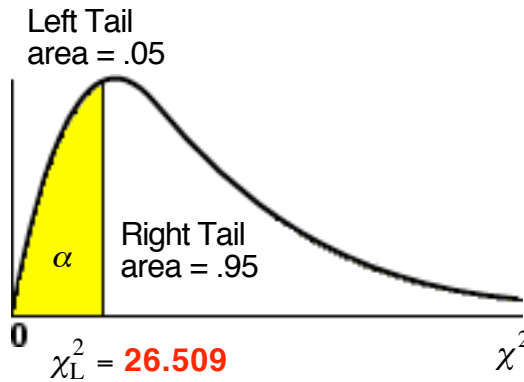
Chi-Square Distribution: Critical Values										
	Area in the Right Tail									
D of F	0.995	0.99	0.975	0.95	0.9	0.10	0.05	0.025	0.01	0.005
50	27.991	29.707	32.357	34.764	37.689	63.167	67.505	71.420	76.154	79.490

Finding The Left Tail χ^2_L Critical Value for the χ^2 Distribution for a One Tail (Left Tail) Hypothesis Test

Example 3

Find the Critical χ^2_L Value for an area of $\alpha = .05$ in the **Left tail** and $n = 41$

If $n = 41$ then the Degrees of Freedom = $n - 1 = 41 - 1 = 40$



If the area in the left tail is .05 then the
right tail area is 0.95 for DF = 40 then then $\chi^2_R = 26.509$

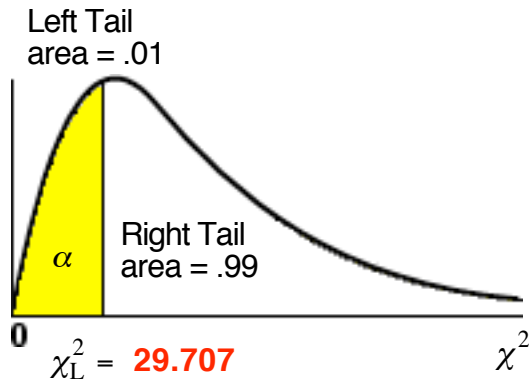
Chi-Square Distribution: Critical Values										
	Area in the Right Tail									
D of F	0.995	0.99	0.975	0.95	0.9	0.10	0.05	0.025	0.01	0.005
40	20.707	21.164	24.433	26.509	29.051	51.805	55.758	59.342	63.691	66.766

Finding The Left Tail χ^2_L Critical Value for the χ^2 Distribution for a One Tail (Left Tail) Hypothesis Test

Example 4

Find the Critical χ^2_L Value for an area of $\alpha = .01$ in the **Left tail** and $n = 51$

If $n = 51$ then the Degrees of Freedom = $n - 1 = 51 - 1 = 50$



If the area in the left tail is .01 then the

f the area in the right tail is 0.99 for DF = 50 then then $\chi^2_R = 29.707$

Chi-Square Distribution: Critical Values										
	Area in the Right Tail									
D of F	0.995	0.99	0.975	0.95	0.9	0.10	0.05	0.025	0.01	0.005
50	27.991	29.707	32.357	34.764	37.689	63.167	67.505	71.420	76.154	79.490

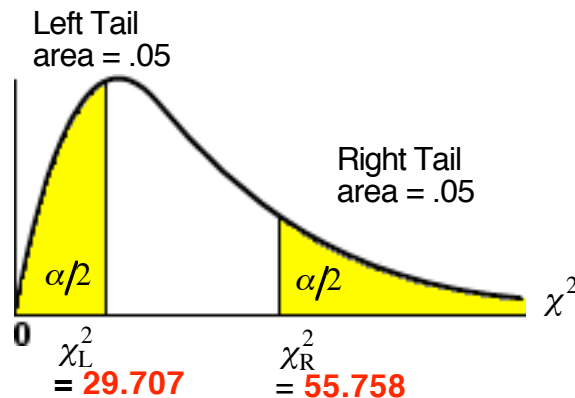
Finding The Left Tail χ_L^2 Critical Value and the Right Tail χ_R^2 Critical Value for the χ^2 Distribution in a Two Tail Hypothesis Test

Example 5

Find the Critical χ_L^2 Value and the Critical χ_R^2 Value for $\alpha = .10$ in in a Two Tail Hypothesis Test

if the total area for two tails is $\alpha = .10$ then the area of the left and right tails is $\alpha/2 = .05$

If $n = 41$ then the Degrees of Freedom = $n - 1 = 41 - 1 = 40$



If the right tail area 0.05 for DF = 40 then $\chi_R^2 = 55.758$

Chi-Square Distribution: Critical Values										
	Area in the Right Tail									
D of F	0.995	0.99	0.975	0.95	0.9	0.10	0.05	0.025	0.01	0.005
40	20.707	21.164	24.433	26.509	29.051	51.805	55.758	59.342	63.691	66.766

If the area in the left tail is .05 then the area to it's right is 0.95 for DF = 40 so $\chi_R^2 = 29.707$

Chi-Square Distribution: Critical Values										
	Area in the Right Tail									
D of F	0.995	0.99	0.975	0.95	0.9	0.10	0.05	0.025	0.01	0.005
40	20.707	21.164	24.433	26.509	29.051	51.805	55.758	59.342	63.691	66.766

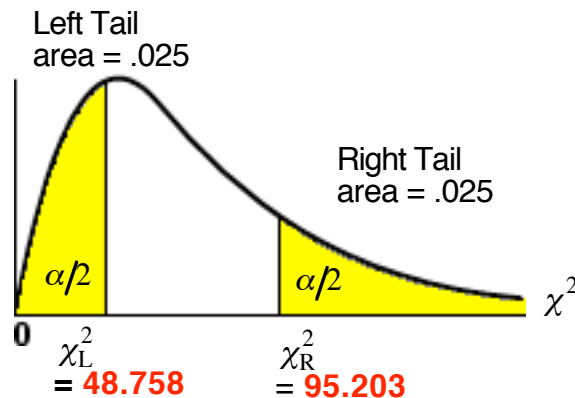
Finding The Left Tail χ_L^2 Critical Value and the Right Tail χ_R^2 Critical Value for the χ^2 Distribution in a Two Tail Hypothesis Test

Example 6

Find the Critical χ_L^2 Value and the Critical χ_R^2 Value for $\alpha = .05$ in in a Two Tail Hypothesis Test

if the total area for two tails is $\alpha = .10$ then the area of the left and right tails is $\alpha/2 = .025$

If $n = 71$ then the Degrees of Freedom = $n - 1 = 71 - 1 = 70$



If the right tail area 0.025 for DF = 70 then $\chi_R^2 = 95.203$

Chi-Square Distribution: Critical Values										
	Area in the Right Tail									
D of F	0.995	0.99	0.975	0.95	0.9	0.10	0.05	0.025	0.01	0.005
70	43.275	45.442	48.758	51.739	55.329	85.527	90.531	95.023	100.425	104.215

If the area in the left tail is .025 then the

area to it's right is 0.975 for DF = 70 so $\chi_R^2 = 48.758$

Chi-Square Distribution: Critical Values										
	Area in the Right Tail									
D of F	0.995	0.99	0.975	0.95	0.9	0.10	0.05	0.025	0.01	0.005
70	43.275	45.442	48.758	51.739	55.329	85.527	90.531	95.023	100.425	104.215