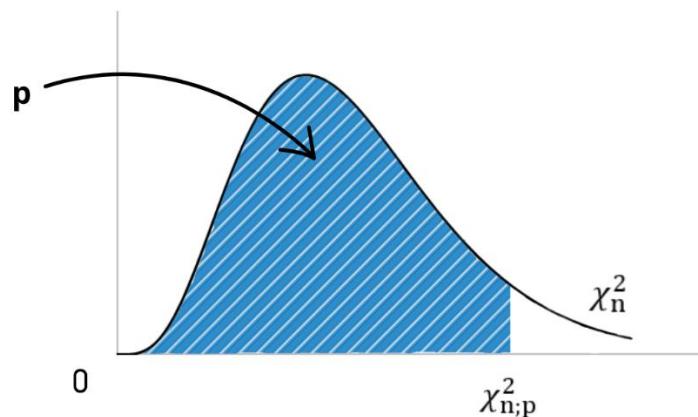


Distribución χ^2 de Pearson



Función de distribución: $p = P(\chi_n^2 \leq \chi_{n;p}^2) = \{2^{n/2} \Gamma(n/2)\}^{-1} \int_0^{\chi_{n;p}^2} x^{(n/2)-1} e^{-x/2} dx$

Dado que la expresión no es nada manejable se suele trabajar con la siguiente tabla.

	p												
df	0,005	0,01	0,025	0,05	0,10	0,25	0,50	0,75	0,90	0,95	0,975	0,99	0,995
1	0,00004	0,00016	0,00098	0,00393	0,01579	0,10153	0,45494	1,3233	2,7055	3,8415	5,0239	6,6349	7,8794
2	0,01002	0,02010	0,05064	0,10259	0,21072	0,57536	1,3863	2,7726	4,6052	5,9915	7,3778	9,2103	10,5966
3	0,07172	0,11483	0,21580	0,35185	0,58437	1,2125	2,3660	4,1083	6,2514	7,8147	9,3484	11,3449	12,8382
4	0,20699	0,29711	0,48442	0,71072	1,0636	1,9226	3,3567	5,3853	7,7794	9,4877	11,1433	13,2767	14,8603
5	0,41174	0,55430	0,83121	1,1455	1,6103	2,6746	4,3515	6,6257	9,2364	11,0705	12,8325	15,0863	16,7496
6	0,67573	0,87209	1,2373	1,6354	2,2041	3,4546	5,3481	7,8408	10,6446	12,5916	14,4494	16,8119	18,5476
7	0,98926	1,2390	1,6899	2,1673	2,8331	4,2549	6,3458	9,0371	12,0170	14,0671	16,0128	18,4753	20,2777
8	1,3444	1,6465	2,1797	2,7326	3,4895	5,0706	7,3441	10,2189	13,3616	15,5073	17,5345	20,0902	21,9550
9	1,7349	2,0879	2,7004	3,3251	4,1682	5,8988	8,3428	11,3888	14,6837	16,9190	19,0228	21,6660	23,5894
10	2,1559	2,5582	3,2470	3,9403	4,8652	6,7372	9,3418	12,5489	15,9872	18,3070	20,4832	23,2093	25,1882
11	2,6032	3,0535	3,8157	4,5748	5,5778	7,5841	10,3410	13,7007	17,2750	19,6751	21,9200	24,7250	26,7568
12	3,0738	3,5706	4,4038	5,2260	6,3038	8,4384	11,3403	14,8454	18,5493	21,0261	23,3367	26,2170	28,2995
13	3,5650	4,1069	5,0088	5,8919	7,0415	9,2991	12,3398	15,9839	19,8119	22,3620	24,7356	27,6882	29,8195
14	4,0747	4,6604	5,6287	6,5706	7,7895	10,1653	13,3393	17,1169	21,0641	23,6848	26,1189	29,1412	31,3193
15	4,6009	5,2293	6,2621	7,2609	8,5468	11,0365	14,3389	18,2451	22,3071	24,9958	27,4884	30,5779	32,8013
16	5,1422	5,8122	6,9077	7,9616	9,3122	11,9122	15,3385	19,3689	23,5418	26,2962	28,8454	31,9999	34,2672
17	5,6972	6,4078	7,5642	8,6718	10,0852	12,7919	16,3382	20,4887	24,7690	27,5871	30,1910	33,4087	35,7185
18	6,2648	7,0149	8,2307	9,3905	10,8649	13,6753	17,3379	21,6049	25,9894	28,8693	31,5264	34,8053	37,1565
19	6,84407	7,6327	8,9065	10,1170	11,6509	14,5620	18,3377	22,7178	27,2036	30,1435	32,8523	36,1909	38,5823
20	7,4338	8,2604	9,5908	10,8508	12,4426	15,4518	19,3374	23,8277	28,4120	31,4104	34,1696	37,5662	39,9968
21	8,0337	8,8972	10,2829	11,5913	13,2396	16,3444	20,3372	24,9348	29,6151	32,6706	35,4789	38,9322	41,4011
22	8,6427	9,5425	10,9823	12,3380	14,0415	17,2396	21,3370	26,0393	30,8133	33,9244	36,7807	40,2894	42,7957
23	9,2604	10,1957	11,6886	13,0905	14,8480	18,1373	22,3369	27,1413	32,0069	35,1725	38,0756	41,6384	44,1813
24	9,8862	10,8564	12,4012	13,8484	15,6587	19,0373	23,3367	28,2412	33,1962	36,4150	39,3641	42,9798	45,5585
25	10,5197	11,5240	13,1197	14,6114	16,4734	19,9393	24,3366	29,3389	34,3816	37,6525	40,6465	44,3141	46,9279
26	11,1602	12,1981	13,8439	15,3792	17,2919	20,8434	25,3365	30,4346	35,5632	38,8851	41,9232	45,6417	48,2899
27	11,8076	12,8785	14,5734	16,1514	18,1139	21,7494	26,3363	31,5284	36,7412	40,1133	43,1945	46,9629	49,6449
28	12,4613	13,5647	15,3079	16,9279	18,9392	22,6572	27,3362	32,6205	37,9159	41,3371	44,4608	48,2782	50,9934
29	13,1211	14,2565	16,0471	17,7084	19,7677	23,5666	28,3361	33,7109	39,0875	42,5570	45,7223	49,5879	52,3356
30	13,7867	14,9535	16,7908	18,4927	20,5992	24,4776	29,3360	34,7997	40,2560	43,7730	46,9792	50,8922	53,6720

31	14,4578	15,6555	17,5387	19,2806	21,4336	25,3901	30,3359	35,8871	41,4217	44,9853	48,2319	52,1914	55,0027
32	15,1340	16,3622	18,2908	20,0719	22,2706	26,3041	31,3359	36,9730	42,5847	46,1943	49,4804	53,4858	56,3281
33	15,8153	17,0735	19,0467	20,8665	23,1102	27,2194	32,3358	38,0575	43,7452	47,3999	50,7251	54,7755	57,6484
34	16,5013	17,7891	19,8063	21,6643	23,9523	28,1361	33,3357	39,1408	44,9032	48,6024	51,9660	56,0609	58,9639
35	17,1918	18,5089	20,5694	22,4650	24,7967	29,0540	34,3356	40,2228	46,0588	49,8018	53,2033	57,3421	60,2748
36	17,8867	19,2327	21,3359	23,2686	25,6433	29,9730	35,3356	41,3036	47,2122	50,9985	54,4373	58,6192	61,5812
37	18,5858	19,9602	22,1056	24,0749	26,4921	30,8933	36,3355	42,3833	48,3634	52,1923	55,6680	59,8925	62,8833
38	19,2889	20,6914	22,8785	24,8839	27,3430	31,8146	37,3355	43,4619	49,5126	53,3835	56,8955	61,1621	64,1814
39	19,9959	21,4262	23,6543	25,6954	28,1958	32,7369	38,3354	44,5395	50,6598	54,5722	58,1201	62,4281	65,4756
40	20,7065	22,1643	24,4330	26,5093	29,0505	33,6603	39,3353	45,6160	51,8051	55,7585	59,3417	63,6907	66,7660
41	21,4208	22,9056	25,2145	27,3256	29,9071	34,5846	40,3353	46,6916	52,9485	56,9424	60,5606	64,9501	68,0527
42	22,1385	23,6501	25,9987	28,1440	30,7654	35,5099	41,3352	47,7663	54,0902	58,1240	61,7768	66,2062	69,3360
43	22,8595	24,3976	26,7854	28,9647	31,6255	36,4361	42,3352	48,8400	55,2302	59,3035	62,9904	67,4593	70,6159
44	23,5837	25,1480	27,5746	29,7875	32,4871	37,3631	43,3352	49,9129	56,3685	60,4809	64,2015	68,7095	71,8926
45	24,3110	25,9013	28,3662	30,6123	33,3504	38,2910	44,3351	50,9849	57,5053	61,6562	65,4102	69,9568	73,1661
46	25,0413	26,6572	29,1601	31,4390	34,2152	39,2197	45,3351	52,0562	58,6405	62,8296	66,6165	71,2014	74,4365
47	25,7746	27,4158	29,9562	32,2676	35,0814	40,1492	46,3350	53,1267	59,7743	64,0011	67,8206	72,4433	75,7041
48	26,5106	28,1770	30,7545	33,0981	35,9491	41,0794	47,3350	54,1964	60,9066	65,1708	69,0226	73,6826	76,9688
49	27,2493	28,9406	31,5549	33,9303	36,8182	42,0104	48,3350	55,2653	62,0375	66,3386	70,2224	74,9195	78,2307
50	27,9907	29,7067	32,3574	34,7643	37,6886	42,9421	49,3349	56,3336	63,1671	67,5048	71,4202	76,1539	79,4900
51	28,7347	30,4750	33,1618	35,5999	38,5604	43,8745	50,3349	57,4012	64,2954	68,6693	72,6160	77,3860	80,7467
52	29,4812	31,2457	33,9681	36,4371	39,4334	44,8075	51,3349	58,4681	65,4224	69,8322	73,8099	78,6158	82,0008
53	30,2300	32,0185	34,7763	37,2759	40,3076	45,7412	52,3348	59,5344	66,5482	70,9935	75,0019	79,8433	83,2526
54	30,9813	32,7934	35,5863	38,1162	41,1830	46,6755	53,3348	60,6000	67,6728	72,1532	76,1920	81,0688	84,5019
55	31,7348	33,5705	36,3981	38,9580	42,0596	47,6105	54,3348	61,6650	68,7962	73,3115	77,3805	82,2921	85,7490
56	32,4905	34,3495	37,2116	39,8013	42,9373	48,5460	55,3348	62,7294	69,9185	74,4683	78,5672	83,5134	86,9938
57	33,2484	35,1305	38,0267	40,6459	43,8161	49,4821	56,3347	63,7933	71,0397	75,6237	79,7522	84,7328	88,2364
58	34,0084	35,9135	38,8435	41,4920	44,6960	50,4188	57,3347	64,8565	72,1598	76,7778	80,9356	85,9502	89,4769
59	34,7704	36,6982	39,6619	42,3393	45,5770	51,3560	58,3347	65,9193	73,2789	77,9305	82,1174	87,1657	90,7153
60	35,5345	37,4849	40,4817	43,1880	46,4589	52,2938	59,3347	66,9815	74,3970	79,0819	83,2977	88,3794	91,9517
61	36,3005	38,2732	41,3031	44,0379	47,3418	53,2321	60,3346	68,0431	75,5141	80,2321	84,4764	89,5913	93,1861
62	37,0684	39,0633	42,1260	44,8890	48,2257	54,1709	61,3346	69,1043	76,6302	81,3810	85,6537	90,8015	94,4187
63	37,8382	39,8551	42,9503	45,7414	49,1105	55,1102	62,3346	70,1650	77,7454	82,5287	86,8296	92,0100	95,6493
64	38,6098	40,6486	43,7760	46,5949	49,9963	56,0500	63,3346	71,2251	78,8596	83,6753	88,0041	93,2169	96,8781
65	39,3831	41,4436	44,6030	47,4496	50,8829	56,9903	64,3346	72,2848	79,9730	84,8206	89,1771	94,4221	98,1051
66	40,1582	42,2402	45,4314	48,3054	51,7705	57,9310	65,3345	73,3441	81,0855	85,9649	90,3489	95,6257	99,3304
67	40,9350	43,0384	46,2610	49,1623	52,6588	58,8722	66,3345	74,4029	82,1971	87,1081	91,5194	96,8278	100,554
68	41,7135	43,8380	47,0920	50,0202	53,5481	59,8138	67,3345	75,4612	83,3079	88,2502	92,6885	98,0284	101,775
69	42,4935	44,6392	47,9242	50,8792	54,4381	60,7559	68,3345	76,5192	84,4179	89,3912	93,8565	99,2275	102,996
70	43,2752	45,4417	48,7576	51,7393	55,3289	61,6983	69,3345	77,5767	85,5270	90,5312	95,0232	100,425	104,214
71	44,0584	46,2457	49,5922	52,6003	56,2206	62,6412	70,3345	78,6337	86,6354	91,6702	96,1887	101,621	105,432
72	44,8431	47,0510	50,4279	53,4623	57,1129	63,5845	71,3344	79,6904	87,7430	92,8083	97,3531	102,816	106,647
73	45,6293	47,8577	51,2648	54,3253	58,0061	64,5282	72,3344	80,7467	88,8499	93,9453	98,5163	104,009	107,861
74	46,4170	48,6657	52,1028	55,1892	58,9000	65,4723	73,3344	81,8026	89,9560	95,0815	99,6783	105,202	109,074
75	47,2060	49,4750	52,9419	56,0541	59,7946	66,4168	74,3344	82,8581	91,0615	96,2167	100,839	106,392	110,285
76	47,9965	50,2856	53,7821	56,9198	60,6899	67,3616	75,3344	83,9133	92,1662	97,3510	101,999	107,582	111,495
77	48,7884	51,0974	54,6234	57,7864	61,5858	68,3068	76,3344	84,9680	93,2702	98,4844	103,158	108,770	112,703
78	49,5816	51,9104	55,4656	58,6539	62,4825	69,2523	77,3344	86,0225	94,3735	99,6169	104,315	109,958	113,910
79	50,3761	52,7247	56,3089	59,5223	63,3799	70,1983	78,3343	87,0765	95,4762	100,748	105,472	111,144	115,116
80	51,1719	53,5401	57,1532	60,3915	64,2778	71,1445	79,3343	88,1303	96,5782	101,879	106,628	112,328	116,321
81	51,9690	54,3566	57,9984	61,2615	65,1765	72,0911	80,3343	89,1836	97,6796	103,009	107,783	113,512	117,524
82	52,7674	55,1743	58,8446	62,1323	66,0757	73,0380	81,3343	90,2367	98,7803	104,138	108,937	114,694	118,726
83	53,5669	55,9931	59,6918	63,0039	66,9756	73,9853	82,3343	91,2894	99,8805	105,267	110,090	115,876	119,926
84	54,3677	56,8130	60,5398	63,8763	67,8761	74,9328	83,3343	92,3418	100,980	106,394	111,242	117,056	121,126
85	55,1696	57,6339	61,3888	64,7494	68,7772	75,8807	84,3343	93,3939	102,078	107,521	112,393	118,235	122,324
86	55,9727	58,4559	62,2386	65,6233	69,6788	76,8289	85,3343	94,4457	103,177	108,647	113,543	119,413	123,521



87	56,7769	59,2790	63,0894	66,4979	70,5810	77,7774	86,3342	95,4972	104,275	109,773	114,692	120,591	124,717
88	57,5823	60,1030	63,9409	67,3732	71,4838	78,7262	87,3342	96,5484	105,372	110,898	115,841	121,767	125,912
89	58,3888	60,9281	64,7934	68,2493	72,3872	79,6753	88,3342	97,5993	106,468	112,022	116,989	122,942	127,106
90	59,1963	61,7541	65,6466	69,1260	73,2911	80,6247	89,3342	98,6499	107,565	113,145	118,359	124,116	128,298
91	60,0049	62,5811	66,5007	70,0035	74,1955	81,5743	90,3342	99,7003	108,660	114,267	119,281	125,289	129,490
92	60,8146	63,4090	67,3556	70,8816	75,1005	82,5243	91,3342	100,750	109,755	115,389	120,427	126,461	130,681
93	61,6253	64,2379	68,2112	71,7603	76,0060	83,4745	92,3342	101,800	110,850	116,511	121,571	127,632	131,870
94	62,4370	65,0677	69,0677	72,6398	76,9119	84,4249	93,3342	102,849	111,944	117,631	122,715	128,803	133,059
95	63,2496	65,8984	69,9249	73,5198	77,8184	85,3757	94,3342	103,898	113,037	118,751	123,858	129,972	134,246
96	64,0633	66,7299	70,7828	74,4005	78,7254	86,3267	95,3342	104,947	114,130	119,870	125,000	131,141	135,433
97	64,8780	67,5624	71,6415	75,2819	79,6329	87,2779	96,3342	105,996	115,223	120,989	126,141	132,308	136,618
98	65,6936	68,3957	72,5009	76,1638	80,5408	88,2295	97,3341	107,045	116,315	122,107	127,282	133,475	137,803
99	66,5101	69,2299	73,3611	77,0463	81,4493	89,1812	98,3341	108,093	117,406	123,225	128,422	134,641	138,986
100	67,3276	70,0649	74,2219	77,9295	82,3581	90,1332	99,3341	109,141	118,498	124,342	129,561	135,806	140,169
Z_p	-2,575829	-2,326348	-1,959964	-1,644854	-1,281552	-0,674489	0,00000	0,674489	1,281552	1,644854	1,959964	2,326348	2,575829

NOTAS:

- Para $n > 50$ puede utilizarse la aproximación $\chi^2_{n;p} \cong n \left\{ 1 - \frac{2}{9n} + z_p \sqrt{\frac{2}{9n}} \right\}^3$; donde z_p es el **cuantil p** de una

Normal $N(0, 1)$

- Ejemplos:**

$$\chi^2_{n;p} = \chi^2_{n;1-\alpha}$$

$$\chi^2_{3;0,005} = 0,07172$$

$$\chi^2_{37;0,975} = 55,6680$$

$$\chi^2_{53;0,90} = 53 \left\{ 1 - \frac{2}{9 \cdot 53} + 1,281552 \sqrt{\frac{2}{9 \cdot 53}} \right\}^3 = 66,5407$$

$$P(\chi^2_3 \leq 0,21580) = 0,025 \rightarrow 2,5\%$$

$$P(\chi^2_3 > 0,21580) = 1 - P(\chi^2_3 \leq 0,21580) = 1 - 0,025 = 0,975 \rightarrow 97,5\%$$

$$P(\chi^2_{15} \leq 11,0365) = 0,25 \rightarrow 25\%$$

$$P(11,5913 < \chi^2_{21} \leq 20,3372) = P(\chi^2_{21} \leq 20,3372) - P(\chi^2_{21} \leq 11,5913) = 0,50 - 0,05 = 0,45 \rightarrow 45\%$$

