## J.4   Cumulative Chi-Square Distribution

Table J.4 summarizes partial CDFs for χ^2 distributions with degrees of freedom from 1 to 60, where

$$F(\chi^2) = P(X^2 \leq \chi^2).$$

Each row represents a different χ^2 distribution and each column a different CDF from 0.005 to 0.995. The body of the table presents χ^2 values associated with these various probabilities. For example, if $n = 20$, then df $= 19$ and $\chi^2_{0.025} = 8.91$ is found as the intersection of row "19" and column "0.025." For a χ^2 distribution with 19 degrees of freedom $P(\chi^2 \leq 8.91) = 0.025$. $\chi^2_{0.90} = 27.2$ found as the intersection of row "19" and column "0.90" implies $P(\chi^2 \leq 27.2) = 0.90$. For more examples see Chapters 4 and 6.
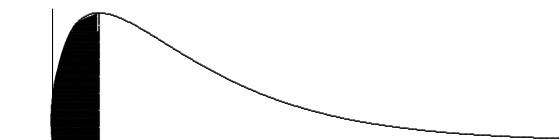
df	0.005	0.01	0.025	0.05	0.10	0.90	0.95	0.975	0.99	0.995
1	0.0000393	0.000157	0.000982	0.00393	0.0158	2.71	3.84	5.02	6.63	7.88
2	0.0100	0.0201	0.0506	0.103	0.211	4.61	5.99	7.38	9.21	10.6
3	0.0717	0.115	0.216	0.352	0.584	6.25	7.81	9.35	11.3	12.8
4	0.207	0.297	0.484	0.711	1.06	7.78	9.49	11.1	13.3	14.9
5	0.412	0.554	0.831	1.15	1.61	9.24	11.1	12.8	15.1	16.7
6	0.676	0.872	1.24	1.64	2.20	10.6	12.6	14.4	16.8	18.5
7	0.989	1.24	1.69	2.17	2.83	12.0	14.1	16.0	18.5	20.3
8	1.34	1.65	2.18	2.73	3.49	13.4	15.5	17.5	20.1	22.0
9	1.73	2.09	2.70	3.33	4.17	14.7	16.9	19.0	21.7	23.6
10	2.16	2.56	3.25	3.94	4.87	16.0	18.3	20.5	23.2	25.2
11	2.60	3.05	3.82	4.57	5.58	17.3	19.7	21.9	24.7	26.8
12	3.07	3.57	4.40	5.23	6.30	18.5	21.0	23.3	26.2	28.3
13	3.57	4.11	5.01	5.89	7.04	19.8	22.4	24.7	27.7	29.8
14	4.07	4.66	5.63	6.57	7.79	21.1	23.7	26.1	29.1	31.3
15	4.60	5.23	6.26	7.26	8.55	22.3	25.0	27.5	30.6	32.8
16	5.14	5.81	6.91	7.96	9.31	23.5	26.3	28.8	32.0	34.3
17	5.70	6.41	7.56	8.67	10.1	24.8	27.6	30.2	33.4	35.7
18	6.26	7.01	8.23	9.39	10.9	26.0	28.9	31.5	34.8	37.2
19	6.84	7.63	8.91	10.1	11.7	27.2	30.1	32.9	36.2	38.6
20	7.43	8.26	9.59	10.9	12.4	28.4	31.4	34.2	37.6	40.0
21	8.03	8.90	10.3	11.6	13.2	29.6	32.7	35.5	38.9	41.4
22	8.64	9.54	11.0	12.3	14.0	30.8	33.9	36.8	40.3	42.8
23	9.26	10.2	11.7	13.1	14.8	32.0	35.2	38.1	41.6	44.2
24	9.89	10.9	12.4	13.8	15.7	33.2	36.4	39.4	43.0	45.6
25	10.5	11.5	13.1	14.6	16.5	34.4	37.7	40.6	44.3	46.9
26	11.2	12.2	13.8	15.4	17.3	35.6	38.9	41.9	45.6	48.3
27	11.8	12.9	14.6	16.2	18.1	36.7	40.1	43.2	47.0	49.6
28	12.5	13.6	15.3	16.9	18.9	37.9	41.3	44.5	48.3	51.0
29	13.1	14.3	16.0	17.7	19.8	39.1	42.6	45.7	49.6	52.3
30	13.8	15.0	16.8	18.5	20.6	40.3	43.8	47.0	50.9	53.7

df	0.005	0.01	0.025	0.05	0.10	0.90	0.95	0.975	0.99	0.995
31	14.5	15.7	17.5	19.3	21.4	41.4	45.0	48.2	52.2	55.0
32	15.1	16.4	18.3	20.1	22.3	42.6	46.2	49.5	53.5	56.3
33	15.8	17.1	19.0	20.9	23.1	43.7	47.4	50.7	54.8	57.6
34	16.5	17.8	19.8	21.7	24.0	44.9	48.6	52.0	56.1	59.0
35	17.2	18.5	20.6	22.5	24.8	46.1	49.8	53.2	57.3	60.3
36	17.9	19.2	21.3	23.3	25.6	47.2	51.0	54.4	58.6	61.6
37	18.6	20.0	22.1	24.1	26.5	48.4	52.2	55.7	59.9	62.9
38	19.3	20.7	22.9	24.9	27.3	49.5	53.4	56.9	61.2	64.2
39	20.0	21.4	23.7	25.7	28.2	50.7	54.6	58.1	62.4	65.5
40	20.7	22.2	24.4	26.5	29.1	51.8	55.8	59.3	63.7	66.8
41	21.4	22.9	25.2	27.3	29.9	52.9	56.9	60.6	64.9	68.1
42	22.1	23.7	26.0	28.1	30.8	54.1	58.1	61.8	66.2	69.3
43	22.9	24.4	26.8	29.0	31.6	55.2	59.3	63.0	67.5	70.6
44	23.6	25.1	27.6	29.8	32.5	56.4	60.5	64.2	68.7	71.9
45	24.3	25.9	28.4	30.6	33.4	57.5	61.7	65.4	70.0	73.2
46	25.0	26.7	29.2	31.4	34.2	58.6	62.8	66.6	71.2	74.4
47	25.8	27.4	30.0	32.3	35.1	59.8	64.0	67.8	72.4	75.7
48	26.5	28.2	30.8	33.1	35.9	60.9	65.2	69.0	73.7	77.0
49	27.2	28.9	31.6	33.9	36.8	62.0	66.3	70.2	74.9	78.2
50	28.0	29.7	32.4	34.8	37.7	63.2	67.5	71.4	76.2	79.5
51	28.7	30.5	33.2	35.6	38.6	64.3	68.7	72.6	77.4	80.7
52	29.5	31.2	34.0	36.4	39.4	65.4	69.8	73.8	78.6	82.0
53	30.2	32.0	34.8	37.3	40.3	66.5	71.0	75.0	79.8	83.3
54	31.0	32.8	35.6	38.1	41.2	67.7	72.2	76.2	81.1	84.5
55	31.7	33.6	36.4	39.0	42.1	68.8	73.3	77.4	82.3	85.7
56	32.5	34.3	37.2	39.8	42.9	69.9	74.5	78.6	83.5	87.0
57	33.2	35.1	38.0	40.6	43.8	71.0	75.6	79.8	84.7	88.2
58	34.0	35.9	38.8	41.5	44.7	72.2	76.8	80.9	86.0	89.5
59	34.8	36.7	39.7	42.3	45.6	73.3	77.9	82.1	87.2	90.7
60	35.5	37.5	40.5	43.2	46.5	74.4	79.1	83.3	88.4	92.0
61	36.3	38.3	41.3	44.0	47.3	75.5	80.2	84.5	89.6	93.2
62	37.1	39.1	42.1	44.9	48.2	76.6	81.4	85.7	90.8	94.4
63	37.8	39.9	43.0	45.7	49.1	77.7	82.5	86.8	92.0	95.6
64	38.6	40.6	43.8	46.6	50.0	78.9	83.7	88.0	93.2	96.9
65	39.4	41.4	44.6	47.4	50.9	80.0	84.8	89.2	94.4	98.1
66	40.2	42.2	45.4	48.3	51.8	81.1	86.0	90.3	95.6	99.3
67	40.9	43.0	46.3	49.2	52.7	82.2	87.1	91.5	96.8	100.6
68	41.7	43.8	47.1	50.0	53.5	83.3	88.3	92.7	98.0	101.8
69	42.5	44.6	47.9	50.9	54.4	84.4	89.4	93.9	99.2	103.0
70	43.3	45.4	48.8	51.7	55.3	85.5	90.5	95.0	100.4	104.2
71	44.1	46.2	49.6	52.6	56.2	86.6	91.7	96.2	101.6	105.4
72	44.8	47.1	50.4	53.5	57.1	87.7	92.8	97.4	102.8	106.6
73	45.6	47.9	51.3	54.3	58.0	88.8	93.9	98.5	104.0	107.9
74	46.4	48.7	52.1	55.2	58.9	90.0	95.1	99.7	105.2	109.1
75	47.2	49.5	52.9	56.1	59.8	91.1	96.2	100.8	106.4	110.3
76	48.0	50.3	53.8	56.9	60.7	92.2	97.4	102.0	107.6	111.5
77	48.8	51.1	54.6	57.8	61.6	93.3	98.5	103.2	108.8	112.7
78	49.6	51.9	55.5	58.7	62.5	94.4	99.6	104.3	110.0	113.9
79	50.4	52.7	56.3	59.5	63.4	95.5	100.7	105.5	111.1	115.1
80	51.2	53.5	57.2	60.4	64.3	96.6	101.9	106.6	112.3	116.3