

Table 26.7 PROBABILITY INTEGRAL OF χ^2 -DISTRIBUTION, INCOMPLETE GAMMA FUNCTION
CUMULATIVE SUMS OF THE POISSON DISTRIBUTION

ν	$x^2=0.001$ $m=0.0005$	0.002 0.0010	0.003 0.0015	0.004 0.0020	0.005 0.0025	0.006 0.0030	0.007 0.0035	0.008 0.0040	0.009 0.0045	0.010 0.0050
1	0.97477	0.96433	0.95632	0.94957	0.94363	0.93826	0.93332	0.92873	0.92442	0.92034
2	0.99950	0.99900	0.99850	0.99800	0.99750	0.99700	0.99651	0.99601	0.99551	0.99501
3	0.99999	0.99998	0.99996	0.99993	0.99991	0.99988	0.99984	0.99981	0.99977	0.99973
4							0.99999	0.99999	0.99999	0.99999
ν	$x^2=0.01$ $m=0.005$	0.02 0.010	0.03 0.015	0.04 0.020	0.05 0.025	0.06 0.030	0.07 0.035	0.08 0.040	0.09 0.045	0.10 0.050
1	0.92034	0.88754	0.86249	0.84148	0.82306	0.80650	0.79134	0.77730	0.76418	0.75183
2	0.99501	0.99005	0.98511	0.98020	0.97531	0.97045	0.96561	0.96079	0.95600	0.95123
3	0.99973	0.99925	0.99863	0.99790	0.99707	0.99616	0.99518	0.99412	0.99301	0.99184
4	0.99999	0.99995	0.99989	0.99980	0.99969	0.99956	0.99940	0.99922	0.99902	0.99879
5			0.99999	0.99998	0.99997	0.99995	0.99993	0.99991	0.99987	0.99984
6							0.99999	0.99999	0.99999	0.99998
ν	$x^2=0.1$ $m=0.05$	0.2 0.10	0.3 0.15	0.4 0.20	0.5 0.25	0.6 0.30	0.7 0.35	0.8 0.40	0.9 0.45	1.0 0.50
1	0.75183	0.65472	0.58388	0.52709	0.47950	0.43858	0.40278	0.37109	0.34278	0.31731
2	0.95123	0.90484	0.86071	0.81873	0.77880	0.74082	0.70469	0.67032	0.63763	0.60653
3	0.99184	0.97759	0.96003	0.94024	0.91889	0.89643	0.87320	0.84947	0.82543	0.80125
4	0.99879	0.99532	0.98981	0.98248	0.97350	0.96306	0.95133	0.93845	0.92456	0.90980
5	0.99984	0.99911	0.99764	0.99533	0.99212	0.98800	0.98297	0.97703	0.97022	0.96257
6	0.99998	0.99985	0.99950	0.99885	0.99784	0.99640	0.99449	0.99207	0.98912	0.98561
7		0.99997	0.99990	0.99974	0.99945	0.99899	0.99834	0.99744	0.99628	0.99483
8			0.99998	0.99994	0.99987	0.99973	0.99953	0.99922	0.99880	0.99825
9				0.99999	0.99997	0.99993	0.99987	0.99978	0.99964	0.99944
10					0.99999	0.99998	0.99997	0.99994	0.99989	0.99983
11							0.99999	0.99998	0.99997	0.99995
12								0.99999	0.99999	0.99999
ν	$x^2=1.1$ $m=0.55$	1.2 0.60	1.3 0.65	1.4 0.70	1.5 0.75	1.6 0.80	1.7 0.85	1.8 0.90	1.9 0.95	2.0 1.00
1	0.29427	0.27332	0.25421	0.23672	0.22067	0.20590	0.19229	0.17971	0.16808	0.15730
2	0.57695	0.54881	0.52205	0.49659	0.47237	0.44933	0.42741	0.40657	0.38674	0.36788
3	0.77707	0.75300	0.72913	0.70553	0.68227	0.65939	0.63693	0.61493	0.59342	0.57241
4	0.89427	0.87810	0.86138	0.84420	0.82664	0.80879	0.79072	0.77248	0.75414	0.73576
5	0.95410	0.94488	0.93493	0.92431	0.91307	0.90125	0.88890	0.87607	0.86280	0.84915
6	0.98154	0.97689	0.97166	0.96586	0.95949	0.95258	0.94512	0.93714	0.92866	0.91970
7	0.99305	0.99093	0.98844	0.98557	0.98231	0.97864	0.97457	0.97008	0.96517	0.95984
8	0.99753	0.99664	0.99555	0.99425	0.99271	0.99092	0.98887	0.98654	0.98393	0.98101
9	0.99917	0.99882	0.99838	0.99782	0.99715	0.99633	0.99537	0.99425	0.99295	0.99147
10	0.99973	0.99961	0.99944	0.99921	0.99894	0.99859	0.99817	0.99766	0.99705	0.99634
11	0.99992	0.99987	0.99981	0.99973	0.99962	0.99948	0.99930	0.99908	0.99882	0.99850
12	0.99998	0.99996	0.99994	0.99991	0.99987	0.99982	0.99975	0.99966	0.99954	0.99941
13	0.99999	0.99999	0.99998	0.99997	0.99996	0.99994	0.99991	0.99988	0.99983	0.99977
14			0.99999	0.99999	0.99999	0.99998	0.99997	0.99996	0.99994	0.99992
15						0.99999	0.99999	0.99999	0.99998	0.99997
16									0.99999	0.99999

$$Q(x^2|\nu) = 1 - P(x^2|\nu) = \left[2^{\frac{\nu}{2}} \Gamma\left(\frac{\nu}{2}\right) \right]^{-1} \int_{x^2}^{\infty} t^{\frac{\nu}{2}-1} e^{-\frac{t}{2}} dt = \left[\Gamma\left(\frac{\nu}{2}\right) \right]^{-1} \int_{\frac{1}{2}x^2}^{\infty} e^{-t} t^{\frac{\nu}{2}-1} dt = \sum_{j=0}^{c-1} e^{-m} m^j / j! \quad (\nu \text{ even}, c = \frac{1}{2}\nu, m = \frac{1}{2}x^2)$$

Compiled from E. S. Pearson and H. O. Hartley (editors), *Biometrika tables for statisticians*, vol. I. Cambridge Univ. Press, Cambridge, England, 1954 (with permission).

PROBABILITY INTEGRAL OF χ^2 -DISTRIBUTION, INCOMPLETE GAMMA FUNCTION Table 26.7
CUMULATIVE SUMS OF THE POISSON DISTRIBUTION

ν	$\chi^2=2.2$ $m=1.1$	2.4 1.2	2.6 1.3	2.8 1.4	3.0 1.5	3.2 1.6	3.4 1.7	3.6 1.8	3.8 1.9	4.0 2.0
1	0.13801	0.12134	0.10686	0.09426	0.08327	0.07364	0.06520	0.05778	0.05125	0.04550
2	0.33287	0.30119	0.27253	0.24660	0.22313	0.20190	0.18268	0.16530	0.14957	0.13534
3	0.53195	0.49363	0.45749	0.42350	0.39163	0.36181	0.33397	0.30802	0.28389	0.26146
4	0.69903	0.66263	0.62682	0.59183	0.55783	0.52493	0.49325	0.46284	0.43375	0.40601
5	0.82084	0.79147	0.76137	0.73079	0.69999	0.66918	0.63857	0.60831	0.57856	0.54942
6	0.90042	0.87949	0.85711	0.83350	0.80885	0.78336	0.75722	0.73062	0.70372	0.67668
7	0.94795	0.93444	0.91938	0.90287	0.88500	0.86590	0.84570	0.82452	0.80250	0.77978
8	0.97426	0.96623	0.95691	0.94628	0.93436	0.92119	0.90681	0.89129	0.87470	0.85712
9	0.98790	0.98345	0.97807	0.97170	0.96430	0.95583	0.94631	0.93572	0.92408	0.91141
10	0.99457	0.99225	0.98934	0.98575	0.98142	0.97632	0.97039	0.96359	0.95592	0.94735
11	0.99766	0.99652	0.99503	0.99311	0.99073	0.98781	0.98431	0.98019	0.97541	0.96992
12	0.99903	0.99850	0.99777	0.99680	0.99554	0.99396	0.99200	0.98962	0.98678	0.98344
13	0.99961	0.99938	0.99903	0.99856	0.99793	0.99711	0.99606	0.99475	0.99314	0.99119
14	0.99985	0.99975	0.99960	0.99938	0.99907	0.99866	0.99813	0.99743	0.99655	0.99547
15	0.99994	0.99990	0.99984	0.99974	0.99960	0.99940	0.99913	0.99878	0.99832	0.99774
16	0.99998	0.99996	0.99994	0.99989	0.99983	0.99974	0.99961	0.99944	0.99921	0.99890
17	0.99999	0.99999	0.99998	0.99996	0.99993	0.99989	0.99983	0.99975	0.99964	0.99948
18			0.99999	0.99998	0.99993	0.99989	0.99983	0.99975	0.99964	0.99948
19				0.99999	0.99997	0.99995	0.99993	0.99989	0.99984	0.99976
20					0.99999	0.99998	0.99997	0.99995	0.99993	0.99989
21						0.99999	0.99999	0.99998	0.99997	0.99995
22								0.99999	0.99999	0.99998
										0.99999
ν	$\chi^2=4.2$ $m=2.1$	4.4 2.2	4.6 2.3	4.8 2.4	5.0 2.5	5.2 2.6	5.4 2.7	5.6 2.8	5.8 2.9	6.0 3.0
1	0.04042	0.03594	0.03197	0.02846	0.02535	0.02259	0.02014	0.01796	0.01603	0.01431
2	0.12246	0.11080	0.10026	0.09072	0.08209	0.07427	0.06721	0.06081	0.05502	0.04979
3	0.24066	0.22139	0.20354	0.18704	0.17180	0.15772	0.14474	0.13278	0.12176	0.11161
4	0.37962	0.35457	0.33085	0.30844	0.28730	0.26739	0.24866	0.23108	0.21459	0.19915
5	0.52099	0.49337	0.46662	0.44077	0.41588	0.39196	0.36904	0.34711	0.32617	0.30622
6	0.64963	0.62271	0.59604	0.56971	0.54381	0.51843	0.49363	0.46945	0.44596	0.42319
7	0.75647	0.73272	0.70864	0.68435	0.65996	0.63557	0.61127	0.58715	0.56329	0.53975
8	0.83864	0.81935	0.79935	0.77872	0.75758	0.73600	0.71409	0.69194	0.66962	0.64723
9	0.89776	0.88317	0.86769	0.85138	0.83431	0.81654	0.79814	0.77919	0.75976	0.73992
10	0.93787	0.92750	0.91625	0.90413	0.89118	0.87742	0.86291	0.84768	0.83178	0.81526
11	0.96370	0.95672	0.94898	0.94046	0.93117	0.92109	0.91026	0.89868	0.88637	0.87337
12	0.97955	0.97509	0.97002	0.96433	0.95798	0.95096	0.94327	0.93489	0.92583	0.91608
13	0.98887	0.98614	0.98298	0.97934	0.97519	0.97052	0.96530	0.95951	0.95313	0.94615
14	0.99414	0.99254	0.99064	0.98841	0.98581	0.98283	0.97943	0.97559	0.97128	0.96649
15	0.99701	0.99610	0.99501	0.99369	0.99213	0.99029	0.98816	0.98571	0.98291	0.97975
16	0.99851	0.99802	0.99741	0.99666	0.99575	0.99467	0.99338	0.99187	0.99012	0.98810
17	0.99928	0.99902	0.99869	0.99828	0.99777	0.99715	0.99639	0.99550	0.99443	0.99319
18	0.99966	0.99953	0.99936	0.99914	0.99886	0.99851	0.99809	0.99757	0.99694	0.99620
19	0.99985	0.99978	0.99969	0.99958	0.99943	0.99924	0.99901	0.99872	0.99836	0.99793
20	0.99993	0.99990	0.99986	0.99980	0.99972	0.99962	0.99950	0.99934	0.99914	0.99890
21	0.99997	0.99995	0.99993	0.99991	0.99987	0.99982	0.99975	0.99967	0.99956	0.99943
22	0.99999	0.99998	0.99997	0.99996	0.99994	0.99991	0.99988	0.99984	0.99978	0.99971
23	0.99999	0.99999	0.99999	0.99998	0.99997	0.99996	0.99994	0.99992	0.99989	0.99986
24			0.99999	0.99999	0.99999	0.99998	0.99997	0.99996	0.99995	0.99993
25				0.99999	0.99999	0.99999	0.99999	0.99998	0.99998	0.99997
26	$\phi = \frac{1}{2}(\chi^2 - \chi_0^2)$							$w = \nu - \nu_0 > 0$		
27	Interpolation on χ^2							0.99999		

$$Q(\chi^2|\nu) = Q(\chi_0^2|\nu_0-4)\left[\frac{1}{2}\phi^2\right] + Q(\chi_0^2|\nu_0-2)\left[\phi-\phi^2\right] + Q(\chi_0^2|\nu_0)\left[1-\phi+\frac{1}{2}\phi^2\right]$$

Double Entry Interpolation

$$Q(\chi^2|\nu) = Q(\chi_0^2|\nu_0-4)\left[\frac{1}{2}\phi^2\right] + Q(\chi_0^2|\nu_0-2)\left[\phi-\phi^2-w\phi\right] + Q(\chi_0^2|\nu_0-1)\left[\frac{1}{2}w^2-\frac{1}{2}w+w\phi\right] \\ + Q(\chi_0^2|\nu_0)\left[1-w^2-\phi+\frac{1}{2}\phi^2+w\phi\right] + Q(\chi_0^2|\nu_0+1)\left[\frac{1}{2}w^2+\frac{1}{2}w-w\phi\right]$$

Table 26.7 PROBABILITY INTEGRAL OF χ^2 -DISTRIBUTION, INCOMPLETE GAMMA FUNCTION CUMULATIVE SUMS OF THE POISSON DISTRIBUTION

ν	$\chi^2 = 6.2$ $m = 3.1$	6.4 3.2	6.6 3.3	6.8 3.4	7.0 3.5	7.2 3.6	7.4 3.7	7.6 3.8	7.8 3.9	8.0 4.0
1	0.01278	0.01141	0.01020	0.00912	0.00815	0.00729	0.00652	0.00584	0.00522	0.00468
2	0.04505	0.04076	0.03688	0.03337	0.03020	0.02732	0.02472	0.02237	0.02024	0.01832
3	0.10228	0.09369	0.08580	0.07855	0.07190	0.06579	0.06018	0.05504	0.05033	0.04601
4	0.18470	0.17120	0.15860	0.14684	0.13589	0.12569	0.11620	0.10738	0.09919	0.09158
5	0.28724	0.26922	0.25213	0.23595	0.22064	0.20619	0.19255	0.17970	0.16761	0.15624
6	0.40116	0.37990	0.35943	0.33974	0.32085	0.30275	0.28543	0.26890	0.25313	0.23810
7	0.51660	0.49390	0.47168	0.45000	0.42888	0.40836	0.38845	0.36918	0.35056	0.33259
8	0.62484	0.60252	0.58034	0.55836	0.53663	0.51522	0.49415	0.47349	0.45325	0.43347
9	0.71975	0.69931	0.67869	0.65793	0.63712	0.61631	0.59555	0.57490	0.55442	0.53415
10	0.79819	0.78061	0.76259	0.74418	0.72544	0.70644	0.68722	0.66784	0.64837	0.62884
11	0.85969	0.84539	0.83049	0.81504	0.79908	0.78266	0.76583	0.74862	0.73110	0.71330
12	0.90567	0.89459	0.88288	0.87054	0.85761	0.84412	0.83009	0.81556	0.80056	0.78513
13	0.93857	0.93038	0.92157	0.91216	0.90215	0.89155	0.88038	0.86865	0.85638	0.84360
14	0.96120	0.95538	0.94903	0.94215	0.93471	0.92673	0.91819	0.90911	0.89948	0.88933
15	0.97619	0.97222	0.96782	0.96296	0.95765	0.95186	0.94559	0.93882	0.93155	0.92378
16	0.98579	0.98317	0.98022	0.97693	0.97326	0.96921	0.96476	0.95989	0.95460	0.94887
17	0.99174	0.99007	0.98816	0.98599	0.98355	0.98081	0.97775	0.97437	0.97064	0.96655
18	0.99532	0.99429	0.99309	0.99171	0.99013	0.98833	0.98630	0.98402	0.98147	0.97864
19	0.99741	0.99679	0.99606	0.99521	0.99421	0.99307	0.99176	0.99026	0.98857	0.98667
20	0.99860	0.99824	0.99781	0.99729	0.99669	0.99598	0.99515	0.99420	0.99311	0.99187
21	0.99926	0.99905	0.99880	0.99850	0.99814	0.99771	0.99721	0.99662	0.99594	0.99514
22	0.99962	0.99950	0.99936	0.99919	0.99898	0.99873	0.99843	0.99807	0.99765	0.99716
23	0.99981	0.99974	0.99967	0.99957	0.99945	0.99931	0.99913	0.99892	0.99867	0.99837
24	0.99990	0.99987	0.99983	0.99978	0.99971	0.99963	0.99953	0.99941	0.99926	0.99908
25	0.99995	0.99994	0.99991	0.99989	0.99985	0.99981	0.99975	0.99968	0.99960	0.99949
26	0.99998	0.99997	0.99996	0.99994	0.99992	0.99990	0.99987	0.99983	0.99978	0.99973
27	0.99999	0.99999	0.99998	0.99997	0.99996	0.99995	0.99993	0.99991	0.99989	0.99985
28		0.99999	0.99999	0.99999	0.99998	0.99998	0.99997	0.99996	0.99994	0.99992
29				0.99999	0.99999	0.99999	0.99998	0.99998	0.99997	0.99996
30					0.99999	0.99999	0.99999	0.99999	0.99999	0.99998
ν	$\chi^2 = 8.2$ $m = 4.1$	8.4 4.2	8.6 4.3	8.8 4.4	9.0 4.5	9.2 4.6	9.4 4.7	9.6 4.8	9.8 4.9	10.0 5.0
1	0.00419	0.00375	0.00336	0.00301	0.00270	0.00242	0.00217	0.00195	0.00175	0.00157
2	0.01657	0.01500	0.01357	0.01228	0.01111	0.01005	0.00910	0.00823	0.00745	0.00674
3	0.04205	0.03843	0.03511	0.03207	0.02929	0.02675	0.02442	0.02229	0.02034	0.01857
4	0.08452	0.07798	0.07191	0.06630	0.06110	0.05629	0.05184	0.04773	0.04394	0.04043
5	0.14555	0.13553	0.12612	0.11731	0.10906	0.10135	0.09413	0.08740	0.08110	0.07524
6	0.22381	0.21024	0.19736	0.18514	0.17358	0.16264	0.15230	0.14254	0.13333	0.12465
7	0.31529	0.29865	0.28266	0.26734	0.25266	0.23861	0.22520	0.21240	0.20019	0.18857
8	0.41418	0.39540	0.37715	0.35945	0.34230	0.32571	0.30968	0.29423	0.27935	0.26503
9	0.51412	0.49439	0.47499	0.45594	0.43727	0.41902	0.40120	0.38383	0.36692	0.35049
10	0.60931	0.58983	0.57044	0.55118	0.53210	0.51323	0.49461	0.47626	0.45821	0.44049
11	0.69528	0.67709	0.65876	0.64035	0.62189	0.60344	0.58502	0.56669	0.54846	0.53039
12	0.76931	0.75314	0.73666	0.71991	0.70293	0.68576	0.66844	0.65101	0.63350	0.61596
13	0.83033	0.81660	0.80244	0.78788	0.77294	0.75768	0.74211	0.72627	0.71020	0.69393
14	0.87865	0.86746	0.85579	0.84365	0.83105	0.81803	0.80461	0.79081	0.77666	0.76218
15	0.91551	0.90675	0.89749	0.88774	0.87752	0.86683	0.85569	0.84412	0.83213	0.81974
16	0.94269	0.93606	0.92897	0.92142	0.91341	0.90495	0.89603	0.88667	0.87686	0.86663
17	0.96208	0.95723	0.95198	0.94633	0.94026	0.93378	0.92687	0.91954	0.91179	0.90361
18	0.97551	0.97207	0.96830	0.96420	0.95974	0.95493	0.94974	0.94418	0.93824	0.93191
19	0.98454	0.98217	0.97955	0.97666	0.97348	0.97001	0.96623	0.96213	0.95771	0.95295
20	0.99046	0.98887	0.98709	0.98511	0.98291	0.98047	0.97779	0.97486	0.97166	0.96817
21	0.99424	0.99320	0.99203	0.99070	0.98921	0.98755	0.98570	0.98365	0.98139	0.97891
22	0.99659	0.99593	0.99518	0.99431	0.99333	0.99222	0.99098	0.98958	0.98803	0.98630
23	0.99802	0.99761	0.99714	0.99659	0.99596	0.99524	0.99442	0.99349	0.99245	0.99128
24	0.99888	0.99863	0.99833	0.99799	0.99760	0.99714	0.99661	0.99601	0.99532	0.99455
25	0.99937	0.99922	0.99905	0.99884	0.99860	0.99831	0.99798	0.99760	0.99716	0.99665
26	0.99966	0.99957	0.99947	0.99934	0.99919	0.99902	0.99882	0.99858	0.99830	0.99798
27	0.99981	0.99977	0.99971	0.99963	0.99955	0.99944	0.99932	0.99917	0.99900	0.99880
28	0.99990	0.99987	0.99984	0.99980	0.99975	0.99969	0.99962	0.99953	0.99942	0.99930
29	0.99995	0.99993	0.99991	0.99989	0.99986	0.99983	0.99979	0.99973	0.99967	0.99960
30	0.99997	0.99997	0.99996	0.99994	0.99993	0.99991	0.99988	0.99985	0.99982	0.99977

$$Q(\chi^2|\nu) = 1 - P(\chi^2|\nu) = \left[2^{\frac{\nu}{2}} \Gamma\left(\frac{\nu}{2}\right) \right]^{-1} \int_{\chi^2}^{\infty} e^{-\frac{t}{2}} t^{\frac{\nu}{2}-1} dt = \left[\Gamma\left(\frac{\nu}{2}\right) \right]^{-1} \int_{\frac{1}{2}\chi^2}^{\infty} e^{-t} t^{\frac{\nu}{2}-1} dt = \sum_{j=0}^{\infty} \frac{e^{-\frac{1}{2}\chi^2} (\frac{1}{2}\chi^2)^j}{j!} \quad (\nu \text{ even}, c = \frac{1}{2}\nu, m = \frac{1}{2}\chi^2)$$

Table 26.7

PROBABILITY INTEGRAL OF χ^2 -DISTRIBUTION, INCOMPLETE GAMMA FUNCTION
CUMULATIVE SUMS OF THE POISSON DISTRIBUTION

$\chi^2=10.5$	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0
ν $m=5.25$	5.5	5.75	6.0	6.25	6.5	6.75	7.0	7.25	7.5
1	0.00119	0.00091	0.00070	0.00053	0.00041	0.00031	0.00024	0.00018	0.00011
2	0.00525	0.00409	0.00318	0.00248	0.00193	0.00150	0.00117	0.00091	0.00055
3	0.01476	0.01173	0.00931	0.00738	0.00585	0.00464	0.00367	0.00291	0.00230
4	0.03280	0.02656	0.02148	0.01735	0.01400	0.01128	0.00907	0.00730	0.00586
5	0.06225	0.05138	0.04232	0.03479	0.02854	0.02338	0.01912	0.01561	0.01036
6	0.10511	0.08838	0.07410	0.06197	0.05170	0.04304	0.03575	0.02964	0.02452
7	0.16196	0.13862	0.11825	0.10056	0.08527	0.07211	0.06082	0.05118	0.04297
8	0.23167	0.20170	0.17495	0.15120	0.13025	0.11185	0.09577	0.08177	0.06963
9	0.31154	0.27571	0.24299	0.21331	0.18657	0.16261	0.14126	0.12233	0.10562
10	0.39777	0.35752	0.31991	0.28506	0.25299	0.22367	0.19704	0.17299	0.15138
11	0.48605	0.44326	0.40237	0.36364	0.32726	0.29333	0.26190	0.23299	0.20655
12	0.57218	0.52892	0.48662	0.44568	0.40640	0.36904	0.33377	0.30071	0.26992
13	0.65263	0.61082	0.56901	0.52764	0.48713	0.44781	0.40997	0.37384	0.33960
14	0.72479	0.68604	0.64639	0.60630	0.56622	0.52652	0.48759	0.44971	0.41316
15	0.78717	0.75259	0.71641	0.67903	0.64086	0.60230	0.56374	0.52553	0.48800
16	0.83925	0.80949	0.77762	0.74398	0.70890	0.67276	0.63591	0.59871	0.56152
17	0.88135	0.85656	0.82942	0.80014	0.76896	0.73619	0.70212	0.66710	0.63145
18	0.91436	0.89436	0.87195	0.84724	0.82038	0.79157	0.76106	0.72909	0.69596
19	0.93952	0.92384	0.90587	0.88562	0.86316	0.83857	0.81202	0.78369	0.75380
20	0.95817	0.94622	0.93221	0.91608	0.89779	0.87738	0.85492	0.83050	0.80427
21	0.97166	0.96279	0.95214	0.93962	0.92513	0.90862	0.89010	0.86960	0.84718
22	0.98118	0.97475	0.96686	0.95738	0.94618	0.93316	0.91827	0.90148	0.88229
23	0.98773	0.98319	0.97748	0.97047	0.96201	0.95199	0.94030	0.92687	0.91165
24	0.99216	0.98901	0.98498	0.97991	0.97367	0.96612	0.95715	0.94665	0.93454
25	0.99507	0.99295	0.99015	0.98657	0.98206	0.97650	0.96976	0.96173	0.95230
26	0.99696	0.99555	0.99366	0.99117	0.98798	0.98397	0.97902	0.97300	0.96581
27	0.99815	0.99724	0.99598	0.99429	0.99208	0.98925	0.98567	0.98125	0.97588
28	0.99890	0.99831	0.99749	0.99637	0.99487	0.99290	0.99037	0.98719	0.98324
29	0.99935	0.99899	0.99846	0.99773	0.99672	0.99538	0.99363	0.99138	0.98854
30	0.99963	0.99940	0.99907	0.99860	0.99794	0.99704	0.99585	0.99428	0.99227
$\chi^2=15.5$	16.0	16.5	17.0	17.5	18.0	18.5	19.0	19.5	20.0
ν $m=7.75$	8.0	8.25	8.5	8.75	9.0	9.25	9.5	9.75	10.0
1	0.00008	0.00006	0.00005	0.00004	0.00003	0.00002	0.00002	0.00001	0.00001
2	0.00043	0.00034	0.00026	0.00020	0.00016	0.00012	0.00010	0.00008	0.00005
3	0.00144	0.00113	0.00090	0.00071	0.00056	0.00044	0.00035	0.00027	0.00021
4	0.00377	0.00302	0.00242	0.00193	0.00154	0.00123	0.00099	0.00079	0.00063
5	0.00843	0.00684	0.00555	0.00450	0.00364	0.00295	0.00238	0.00192	0.00155
6	0.01670	0.01375	0.01131	0.00928	0.00761	0.00623	0.00510	0.00416	0.00340
7	0.03010	0.02512	0.02092	0.01740	0.01444	0.01197	0.00991	0.00819	0.00676
8	0.05012	0.04238	0.03576	0.03011	0.02530	0.02123	0.01777	0.01486	0.01240
9	0.07809	0.06688	0.05715	0.04872	0.04144	0.03517	0.02980	0.02519	0.02126
10	0.11487	0.09963	0.08619	0.07436	0.06401	0.05496	0.04709	0.04026	0.03435
11	0.16073	0.14113	0.12356	0.10788	0.09393	0.08158	0.07068	0.06109	0.05269
12	0.21522	0.19124	0.16939	0.14960	0.13174	0.11569	0.10133	0.08853	0.07716
13	0.27719	0.24913	0.22318	0.19930	0.17744	0.15752	0.13944	0.12310	0.10840
14	0.34485	0.31337	0.28380	0.25618	0.23051	0.20678	0.18495	0.16495	0.14671
15	0.41604	0.38205	0.34962	0.31886	0.28986	0.26267	0.23729	0.21373	0.19196
16	0.48837	0.45296	0.41864	0.38560	0.35398	0.32390	0.29544	0.26866	0.24359
17	0.55951	0.52383	0.48871	0.45437	0.42102	0.38884	0.35797	0.32853	0.30060
18	0.62740	0.59255	0.55770	0.52311	0.48902	0.45565	0.42320	0.39182	0.36166
19	0.69033	0.65728	0.62370	0.58987	0.55603	0.52244	0.48931	0.45684	0.42521
20	0.74712	0.71662	0.68516	0.65297	0.62031	0.58741	0.55451	0.52183	0.48957
21	0.79705	0.76965	0.74093	0.71111	0.68039	0.64900	0.61718	0.58514	0.55310
22	0.83990	0.81589	0.79032	0.76336	0.73519	0.70599	0.67597	0.64533	0.61428
23	0.87582	0.85527	0.83304	0.80925	0.78402	0.75749	0.72983	0.70122	0.67185
24	0.90527	0.88808	0.86919	0.84866	0.82657	0.80301	0.77810	0.75199	0.72483
25	0.92891	0.91483	0.89912	0.88179	0.86287	0.84239	0.82044	0.79712	0.77254
26	0.94749	0.93620	0.92341	0.90908	0.89320	0.87577	0.85683	0.83643	0.81464
27	0.96182	0.95295	0.94274	0.93112	0.91806	0.90352	0.88750	0.87000	0.85107
28	0.97266	0.96582	0.95782	0.94859	0.93805	0.92615	0.91285	0.89814	0.88200
29	0.98071	0.97554	0.96939	0.96218	0.95383	0.94427	0.93344	0.92129	0.90779
30	0.98659	0.98274	0.97810	0.97258	0.96608	0.95853	0.94986	0.94001	0.92891

$$\phi = \frac{1}{2}(\chi^2 - \chi_0^2) \quad w = \nu - \nu_0 > 0$$

Interpolation on χ^2

$$Q(\chi^2|\nu) = Q(\chi_0^2|\nu_0-4)\left[\frac{1}{2}\phi^2\right] + Q(\chi_0^2|\nu_0-2)\left[\phi-\phi^2\right] + Q(\chi_0^2|\nu_0)\left[1-\phi+\frac{1}{2}\phi^2\right]$$

Double Entry Interpolation

$$Q(\chi^2|\nu) = Q(\chi_0^2|\nu_0-4)\left[\frac{1}{2}\phi^2\right] + Q(\chi_0^2|\nu_0-2)\left[\phi-\phi^2-w\phi\right] + Q(\chi_0^2|\nu_0-1)\left[\frac{1}{2}w^2-\frac{1}{2}w+w\phi\right] \\ + Q(\chi_0^2|\nu_0)\left[1-w^2-\phi+\frac{1}{2}\phi^2+w\phi\right] + Q(\chi_0^2|\nu_0+1)\left[\frac{1}{2}w^2+\frac{1}{2}w-w\phi\right]$$

**Table 26.7 PROBABILITY INTEGRAL OF χ^2 -DISTRIBUTION, INCOMPLETE GAMMA FUNCTION
CUMULATIVE SUMS OF THE POISSON DISTRIBUTION**

$\chi^2 = 21$	22	23	24	25	26	27	28	29	30
$m = 10.5$	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5	15.0
1	0.00001								
2	0.00003	0.00002	0.00001	0.00001					
3	0.00011	0.00007	0.00004	0.00003	0.00002	0.00001	0.00001		
4	0.00032	0.00020	0.00013	0.00008	0.00005	0.00003	0.00002	0.00001	0.00001
5	0.00081	0.00052	0.00034	0.00022	0.00014	0.00009	0.00006	0.00004	0.00002
6	0.00184	0.00121	0.00080	0.00052	0.00034	0.00022	0.00015	0.00009	0.00006
7	0.00377	0.00254	0.00171	0.00114	0.00076	0.00050	0.00033	0.00022	0.00015
8	0.00715	0.00492	0.00336	0.00229	0.00155	0.00105	0.00071	0.00047	0.00032
9	0.01265	0.00888	0.00620	0.00430	0.00297	0.00204	0.00140	0.00095	0.00065
10	0.02109	0.01511	0.01075	0.00760	0.00535	0.00374	0.00260	0.00181	0.00125
11	0.03337	0.02437	0.01768	0.01273	0.00912	0.00649	0.00460	0.00324	0.00227
12	0.05038	0.03752	0.02773	0.02034	0.01482	0.01073	0.00773	0.00553	0.00394
13	0.07293	0.05536	0.04168	0.03113	0.02308	0.01700	0.01244	0.00905	0.00655
14	0.10163	0.07861	0.06027	0.04582	0.03457	0.02589	0.01925	0.01423	0.01045
15	0.13683	0.10780	0.08414	0.06509	0.04994	0.03802	0.02874	0.02157	0.01609
16	0.17851	0.14319	0.11374	0.08950	0.06982	0.05403	0.04148	0.03162	0.02394
17	0.22629	0.18472	0.14925	0.11944	0.09471	0.07446	0.05807	0.04494	0.03453
18	0.27941	0.23199	0.19059	0.15503	0.12492	0.09976	0.07900	0.06206	0.04838
19	0.33680	0.28426	0.23734	0.19615	0.16054	0.13019	0.10465	0.08343	0.06599
20	0.39713	0.34051	0.28880	0.24239	0.20143	0.16581	0.13526	0.10940	0.08776
21	0.45894	0.39951	0.34398	0.29306	0.24716	0.20645	0.17085	0.14015	0.11400
22	0.52074	0.45989	0.40173	0.34723	0.29707	0.25168	0.21123	0.17568	0.14486
23	0.58109	0.52025	0.46077	0.40381	0.35029	0.30087	0.25597	0.21578	0.18031
24	0.63873	0.57927	0.51980	0.46160	0.40576	0.35317	0.30445	0.26004	0.22013
25	0.69261	0.63574	0.57756	0.51937	0.46237	0.40760	0.35588	0.30785	0.26392
26	0.74196	0.68870	0.63295	0.57597	0.51898	0.46311	0.40933	0.35846	0.31108
27	0.78629	0.73738	0.68501	0.63032	0.57446	0.51860	0.46379	0.41097	0.36090
28	0.82535	0.78129	0.73304	0.68154	0.62784	0.57305	0.51825	0.46445	0.41253
29	0.85915	0.82019	0.77654	0.72893	0.67825	0.62549	0.57171	0.51791	0.46507
30	0.88789	0.85404	0.81526	0.77203	0.72503	0.67513	0.62327	0.57044	0.51760
31	0.91141	0.87899	0.84104	0.80000	0.75703	0.71213	0.66527	0.61644	0.56565
32	0.93001	0.89899	0.86104	0.81900	0.77503	0.72913	0.68127	0.63144	0.57960
33	0.94401	0.91399	0.87604	0.83400	0.78903	0.74213	0.69327	0.64244	0.58960
34	0.95401	0.92499	0.88704	0.84500	0.80003	0.75213	0.70227	0.65044	0.59660
35	0.96101	0.93199	0.89404	0.85200	0.80703	0.75813	0.70727	0.65444	0.60060
36	0.96601	0.93699	0.89904	0.85700	0.81203	0.76313	0.71127	0.65744	0.60260
37	0.96901	0.93999	0.90204	0.86000	0.81503	0.76613	0.71427	0.66044	0.60460
38	0.97101	0.94199	0.90404	0.86200	0.81703	0.76813	0.71627	0.66244	0.60660
39	0.97201	0.94299	0.90504	0.86300	0.81803	0.76913	0.71727	0.66344	0.60760
40	0.97301	0.94399	0.90604	0.86400	0.81903	0.77013	0.71827	0.66444	0.60860
41	0.97401	0.94499	0.90704	0.86500	0.82003	0.77113	0.71927	0.66544	0.60960
42	0.97501	0.94599	0.90804	0.86600	0.82103	0.77213	0.72027	0.66644	0.61060
43	0.97601	0.94699	0.90904	0.86700	0.82203	0.77313	0.72127	0.66744	0.61160
44	0.97701	0.94799	0.91004	0.86800	0.82303	0.77413	0.72227	0.66844	0.61260
45	0.97801	0.94899	0.91104	0.86900	0.82403	0.77513	0.72327	0.66944	0.61360
46	0.97901	0.94999	0.91204	0.87000	0.82503	0.77613	0.72427	0.67044	0.61460
47	0.98001	0.95099	0.91304	0.87100	0.82603	0.77713	0.72527	0.67144	0.61560
48	0.98101	0.95199	0.91404	0.87200	0.82703	0.77813	0.72627	0.67244	0.61660
49	0.98201	0.95299	0.91504	0.87300	0.82803	0.77913	0.72727	0.67344	0.61760
50	0.98301	0.95399	0.91604	0.87400	0.82903	0.78013	0.72827	0.67444	0.61860
51	0.98401	0.95499	0.91704	0.87500	0.83003	0.78113	0.72927	0.67544	0.61960
52	0.98501	0.95599	0.91804	0.87600	0.83103	0.78213	0.73027	0.67644	0.62060
53	0.98601	0.95699	0.91904	0.87700	0.83203	0.78313	0.73127	0.67744	0.62160
54	0.98701	0.95799	0.92004	0.87800	0.83303	0.78413	0.73227	0.67844	0.62260
55	0.98801	0.95899	0.92104	0.87900	0.83403	0.78513	0.73327	0.67944	0.62360
56	0.98901	0.95999	0.92204	0.88000	0.83503	0.78613	0.73427	0.68044	0.62460
57	0.99001	0.96099	0.92304	0.88100	0.83603	0.78713	0.73527	0.68144	0.62560
58	0.99101	0.96199	0.92404	0.88200	0.83703	0.78813	0.73627	0.68244	0.62660
59	0.99201	0.96299	0.92504	0.88300	0.83803	0.78913	0.73727	0.68344	0.62760
60	0.99301	0.96399	0.92604	0.88400	0.83903	0.79013	0.73827	0.68444	0.62860
61	0.99401	0.96499	0.92704	0.88500	0.84003	0.79113	0.73927	0.68544	0.62960
62	0.99501	0.96599	0.92804	0.88600	0.84103	0.79213	0.74027	0.68644	0.63060
63	0.99601	0.96699	0.92904	0.88700	0.84203	0.79313	0.74127	0.68744	0.63160
64	0.99701	0.96799	0.93004	0.88800	0.84303	0.79413	0.74227	0.68844	0.63260
65	0.99801	0.96899	0.93104	0.88900	0.84403	0.79513	0.74327	0.68944	0.63360
66	0.99901	0.96999	0.93204	0.89000	0.84503	0.79613	0.74427	0.69044	0.63460
67	1.00001	0.97099	0.93304	0.89100	0.84603	0.79713	0.74527	0.69144	0.63560
68	1.00001	0.97199	0.93404	0.89200	0.84703	0.79813	0.74627	0.69244	0.63660
69	1.00001	0.97299	0.93504	0.89300	0.84803	0.79913	0.74727	0.69344	0.63760
70	1.00001	0.97399	0.93604	0.89400	0.84903	0.80013	0.74827	0.69444	0.63860
71	1.00001	0.97499	0.93704	0.89500	0.85003	0.80113	0.74927	0.69544	0.63960
72	1.00001	0.97599	0.93804	0.89600	0.85103	0.80213	0.75027	0.69644	0.64060
73	1.00001	0.97699	0.93904	0.89700	0.85203	0.80313	0.75127	0.69744	0.64160
74	1.00001	0.97799	0.94004	0.89800	0.85303	0.80413	0.75227	0.69844	0.64260
75	1.00001	0.97899	0.94104	0.89900	0.85403	0.80513	0.75327	0.69944	0.64360
76	1.00001	0.97999	0.94204	0.90000	0.85503	0.80613	0.75427	0.70044	0.64460
77	1.00001	0.98099	0.94304	0.90100	0.85603	0.80713	0.75527	0.70144	0.64560
78	1.00001	0.98199	0.94404	0.90200	0.85703	0.80813	0.75627	0.70244	0.64660
79	1.00001	0.98299	0.94504	0.90300	0.85803	0.80913	0.75727	0.70344	0.64760
80	1.00001	0.98399	0.94604	0.90400	0.85903	0.81013	0.75827	0.70444	0.64860
81	1.00001	0.98499	0.94704	0.90500	0.86003	0.81113	0.75927	0.70544	0.64960
82	1.00001	0.98599	0.94804	0.90600	0.86103	0.81213	0.76027	0.70644	0.65060
83	1.00001	0.98699	0.94904	0.90700	0.86203	0.81313	0.76127	0.70744	0.65160
84	1.00001	0.98799	0.95004	0.90800	0.86303	0.81413	0.76227	0.70844	0.65260
85	1.00001	0.98899	0.95104	0.90900	0.86403	0.81513	0.76327	0.70944	0.65360
86	1.00001	0.98999	0.95204	0.91000	0.86503	0.81613	0.76427	0.71044	0.65460
87	1.00001	0.99099	0.95304	0.91100	0.86603	0.81713	0.76527	0.71144	0.65560
88	1.00001	0.99199	0.95404	0.91200	0.86703	0.81813	0.76627	0.71244	0.65660
89	1.00001	0.99299	0.95504	0.91300	0.86803	0.81913	0.76727	0.71344	0.65760
90	1.00001	0.99399	0.95604	0.91400	0.86903	0.82013	0.76827	0.71444	0.65860
91	1.00001	0.99499	0.95704	0.91500	0.87003	0.82113	0.76927	0.71544	0.65960
92	1.00001	0.99599	0.95804	0.91600	0.87103	0.82213	0.77027	0.71644	0.66060
93	1.00001	0.99699	0.95904	0.91700	0.87203	0.82313	0.77127	0.71744	0.66160
94	1.00001	0.99799	0.96004	0.91800	0.87303	0.82413	0.77227	0.71844	0.66260
95	1.00001	0.99899	0.96104	0.91900	0.87403	0.82513	0.77327	0.71944	0.66360
96	1.00001	0.99999	0.96204	0.92000	0.87503	0.82613	0.77427	0.72044	0.66460
97	1.00001	1.00000	0.96304	0.92100	0.87603	0.82713	0.77527	0.72144	0.66560
98	1.00001	1.00000	0.96404	0.92200	0.87703	0.82813	0.77627	0.72244	0.66660
99	1.00001	1.00000	0.96504	0.92300	0.87803	0.82913	0.77727	0.72344	0.66760
100	1.00001	1.00000	0.96604	0.92400	0.87903	0.83013	0.77827	0.72444	0.66860
101	1.00001	1.00000	0.96704	0.92500	0.88003	0.83113	0.77927	0.72544	0.66960
102	1.00001	1.							

PROBABILITY INTEGRAL OF χ^2 -DISTRIBUTION, INCOMPLETE GAMMA FUNCTION Table 26.7
CUMULATIVE SUMS OF THE POISSON DISTRIBUTION

ν	$\chi^2=42$ $m=21$	44 22	46 23	48 24	50 25	52 26	54 27	56 28	58 29	60 30
10	0.00001									
11	0.00002	0.00001								
12	0.00003	0.00002	0.00001							
13	0.00006	0.00003	0.00001	0.00001						
14	0.00012	0.00006	0.00003	0.00001	0.00001					
15	0.00023	0.00011	0.00005	0.00003	0.00001	0.00001				
16	0.00040	0.00020	0.00010	0.00005	0.00002	0.00001	0.00001			
17	0.00067	0.00034	0.00017	0.00009	0.00004	0.00002	0.00001	0.00001		
18	0.00111	0.00058	0.00030	0.00015	0.00008	0.00004	0.00002	0.00001		
19	0.00177	0.00094	0.00050	0.00026	0.00013	0.00007	0.00003	0.00002	0.00001	
20	0.00277	0.00151	0.00081	0.00043	0.00022	0.00011	0.00006	0.00003	0.00001	0.00001
21	0.00421	0.00234	0.00128	0.00069	0.00036	0.00019	0.00010	0.00005	0.00003	0.00001
22	0.00625	0.00355	0.00198	0.00109	0.00059	0.00031	0.00016	0.00009	0.00004	0.00002
23	0.00908	0.00526	0.00299	0.00167	0.00092	0.00050	0.00027	0.00014	0.00007	0.00004
24	0.01291	0.00763	0.00443	0.00252	0.00142	0.00078	0.00043	0.00023	0.00012	0.00006
25	0.01797	0.01085	0.00642	0.00373	0.00213	0.00120	0.00066	0.00036	0.00020	0.00011
26	0.02455	0.01512	0.00912	0.00540	0.00314	0.00180	0.00102	0.00056	0.00031	0.00017
27	0.03292	0.02068	0.01272	0.00768	0.00455	0.00265	0.00152	0.00086	0.00048	0.00026
28	0.04336	0.02779	0.01743	0.01072	0.00647	0.00384	0.00224	0.00129	0.00073	0.00041
29	0.05616	0.03670	0.02346	0.01470	0.00903	0.00545	0.00324	0.00189	0.00109	0.00062
30	0.07157	0.04769	0.03107	0.01983	0.01240	0.00762	0.00460	0.00273	0.00160	0.00092

ν	$\chi^2=62$ $m=31$	64 32	66 33	68 34	70 35	72 36	74 37	76 38
21	0.00001							
22	0.00001	0.00001						
23	0.00002	0.00001	0.00001					
24	0.00003	0.00002	0.00001					
25	0.00006	0.00003	0.00002	0.00001				
26	0.00009	0.00005	0.00003	0.00001	0.00001			
27	0.00014	0.00008	0.00004	0.00002	0.00001	0.00001		
28	0.00023	0.00012	0.00007	0.00004	0.00002	0.00001	0.00001	
29	0.00035	0.00019	0.00011	0.00006	0.00003	0.00002	0.00001	
30	0.00052	0.00029	0.00016	0.00009	0.00005	0.00003	0.00001	0.00001

$$Q(\chi^2|\nu) = 1 - P(\chi^2|\nu) = \left[2^{\frac{\nu}{2}} \Gamma\left(\frac{\nu}{2}\right) \right]^{-1} \int_{\chi^2}^{\infty} e^{-\frac{t}{2}} t^{\frac{\nu}{2}-1} dt = \left[\Gamma\left(\frac{\nu}{2}\right) \right]^{-1} \int_{\frac{1}{2}\chi^2}^{\infty} e^{-t} t^{\frac{\nu}{2}-1} dt = \sum_{j=0}^{c-1} e^{-m} m^j / j! \quad (\nu \text{ even}, c=\frac{1}{2}\nu, m=\frac{1}{2}\chi^2)$$

$$\phi = \frac{1}{2}(\chi^2 - \chi_0^2) \quad w = \nu - \nu_0 > 0$$

Interpolation on χ^2

$$Q(\chi^2|\nu) = Q(\chi_0^2|\nu_0-4) \left[\frac{1}{2} \phi^2 \right] + Q(\chi_0^2|\nu_0-2) [\phi - \phi^2] + Q(\chi_0^2|\nu_0) \left[1 - \phi + \frac{1}{2} \phi^2 \right]$$

Double Entry Interpolation

$$Q(\chi^2|\nu) = Q(\chi_0^2|\nu_0-4) \left[\frac{1}{2} \phi^2 \right] + Q(\chi_0^2|\nu_0-2) [\phi - \phi^2 - w\phi] + Q(\chi_0^2|\nu_0-1) \left[\frac{1}{2} w^2 - \frac{1}{2} w + w\phi \right]$$

$$+ Q(\chi_0^2|\nu_0) \left[1 - w^2 - \phi + \frac{1}{2} \phi^2 + w\phi \right] + Q(\chi_0^2|\nu_0+1) \left[\frac{1}{2} w^2 + \frac{1}{2} w - w\phi \right]$$