SY02
Tables Statistiques

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Attention

Pour être utilisable en examen, ce document ne doit comporter aucune surcharge manuscrite.

1 Distributions de probabilité

1.1 Fonction de répartition de la loi binomiale

- Si $X \sim \mathcal{B}(n, p)$, alors $\mathbb{P}(X = x) = C_n^x p^x (1-p)^{n-x} \forall x \in 1, \ldots, n$, $\mathbb{E}(X) = np$ et $\mathrm{Var}(X) = np(1-p)$.
- La table qui suit donne la fonction de répartition pour les valeurs de $p \leq 0.5$. Sachant que si $X \sim \mathcal{B}(n, p)$ alors $n - X \sim \mathcal{B}(n, 1-p)$, on peut en déduire facilement la fonction de répartition pour les valeurs de p supérieures à 0.5.
- Enfin, pour les grandes valeurs de n, on pourra utiliser, si np et $n(1-p)$ sont supérieurs à 5, l'approximation gaussienne : $\mathbb{P}(X \leq x) \simeq \Phi\left(\frac{x+0.5-np}{\sqrt{np(1-p)}}\right)$ où Φ est la fonction de répartition de la loi normale centrée réduite.

$\mathbb{P}(X \leq x)$ où $X \sim \mathcal{B}(n, p)$

		p									
n	x	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50
2	0	0.9025	0.8100	0.7225	0.6400	0.5625	0.4900	0.4225	0.3600	0.3025	0.2500
	1	0.9975	0.9900	0.9775	0.9600	0.9375	0.9100	0.8775	0.8400	0.7975	0.7500
3	0	0.8574	0.7290	0.6141	0.5120	0.4219	0.3430	0.2746	0.2160	0.1664	0.1250
	1	0.9927	0.9720	0.9392	0.8960	0.8438	0.7840	0.7182	0.6480	0.5748	0.5000
	2	0.9999	0.9990	0.9966	0.9920	0.9844	0.9730	0.9571	0.9360	0.9089	0.8750
4	0	0.8145	0.6561	0.5220	0.4096	0.3164	0.2401	0.1785	0.1296	0.0915	0.0625
	1	0.9860	0.9477	0.8905	0.8192	0.7383	0.6517	0.5630	0.4752	0.3910	0.3125
	2	0.9995	0.9963	0.9880	0.9728	0.9492	0.9163	0.8735	0.8208	0.7585	0.6875
	3	1	0.9999	0.9995	0.9984	0.9961	0.9919	0.9850	0.9744	0.9590	0.9375
5	0	0.7738	0.5905	0.4437	0.3277	0.2373	0.1681	0.1160	0.0778	0.0503	0.0312
	1	0.9774	0.9185	0.8352	0.7373	0.6328	0.5282	0.4284	0.3370	0.2562	0.1875
	2	0.9988	0.9914	0.9734	0.9421	0.8965	0.8369	0.7648	0.6826	0.5931	0.5000
	3	1	0.9995	0.9978	0.9933	0.9844	0.9692	0.9460	0.9130	0.8688	0.8125
	4	1	1	0.9999	0.9997	0.9990	0.9976	0.9947	0.9898	0.9815	0.9688
6	0	0.7351	0.5314	0.3771	0.2621	0.1780	0.1176	0.0754	0.0467	0.0277	0.0156
	1	0.9672	0.8857	0.7765	0.6554	0.5339	0.4202	0.3191	0.2333	0.1636	0.1094
	2	0.9978	0.9842	0.9527	0.9011	0.8306	0.7443	0.6471	0.5443	0.4415	0.3438
	3	0.9999	0.9987	0.9941	0.9830	0.9624	0.9295	0.8826	0.8208	0.7447	0.6562
	4	1	0.9999	0.9996	0.9984	0.9954	0.9891	0.9777	0.9590	0.9308	0.8906
	5	1	1	1	0.9999	0.9998	0.9993	0.9982	0.9959	0.9917	0.9844
7	0	0.6983	0.4783	0.3206	0.2097	0.1335	0.0824	0.0490	0.0280	0.0152	0.0078
	1	0.9556	0.8503	0.7166	0.5767	0.4449	0.3294	0.2338	0.1586	0.1024	0.0625
	2	0.9962	0.9743	0.9262	0.8520	0.7564	0.6471	0.5323	0.4199	0.3164	0.2266
	3	0.9998	0.9973	0.9879	0.9667	0.9294	0.8740	0.8002	0.7102	0.6083	0.5000
	4	1	0.9998	0.9988	0.9953	0.9871	0.9712	0.9444	0.9037	0.8471	0.7734
	5	1	1	0.9999	0.9996	0.9987	0.9962	0.9910	0.9812	0.9643	0.9375
	6	1	1	1	1	0.9999	0.9998	0.9994	0.9984	0.9963	0.9922
8	0	0.6634	0.4305	0.2725	0.1678	0.1001	0.0576	0.0319	0.0168	0.0084	0.0039
	1	0.9428	0.8131	0.6572	0.5033	0.3671	0.2553	0.1691	0.1064	0.0632	0.0352
	2	0.9942	0.9619	0.8948	0.7969	0.6785	0.5518	0.4278	0.3154	0.2201	0.1445
	3	0.9996	0.9950	0.9786	0.9437	0.8862	0.8059	0.7064	0.5941	0.4770	0.3633
	4	1	0.9996	0.9971	0.9896	0.9727	0.9420	0.8939	0.8263	0.7396	0.6367
	5	1	1	0.9998	0.9988	0.9958	0.9887	0.9747	0.9502	0.9115	0.8555
	6	1	1	1	0.9999	0.9996	0.9987	0.9964	0.9915	0.9819	0.9648
	7	1	1	1	1	1	0.9999	0.9998	0.9993	0.9983	0.9961
9	0	0.6302	0.3874	0.2316	0.1342	0.0751	0.0404	0.0207	0.0101	0.0046	0.0020
	1	0.9288	0.7748	0.5995	0.4362	0.3003	0.1960	0.1211	0.0705	0.0385	0.0195
	2	0.9916	0.9470	0.8591	0.7382	0.6007	0.4628	0.3373	0.2318	0.1495	0.0898
	3	0.9994	0.9917	0.9661	0.9144	0.8343	0.7297	0.6089	0.4826	0.3614	0.2539
	4	1	0.9991	0.9944	0.9804	0.9511	0.9012	0.8283	0.7334	0.6214	0.5000
	5	1	0.9999	0.9994	0.9969	0.9900	0.9747	0.9464	0.9006	0.8342	0.7461
	6	1	1	1	0.9997	0.9987	0.9957	0.9888	0.9750	0.9502	0.9102
	7	1	1	1	1	0.9999	0.9996	0.9986	0.9962	0.9909	0.9805
	8	1	1	1	1	1	1	0.9999	0.9997	0.9992	0.9980

$\mathbb{P}(X \leq x)$ où $X \sim \mathcal{B}(n,p)$

		p									
n	x	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50
10	0	0.5987	0.3487	0.1969	0.1074	0.0563	0.0282	0.0135	0.0060	0.0025	0.0010
	1	0.9139	0.7361	0.5443	0.3758	0.2440	0.1493	0.0860	0.0464	0.0233	0.0107
	2	0.9885	0.9298	0.8202	0.6778	0.5256	0.3828	0.2616	0.1673	0.0996	0.0547
	3	0.9990	0.9872	0.9500	0.8791	0.7759	0.6496	0.5138	0.3823	0.2660	0.1719
	4	0.9999	0.9984	0.9901	0.9672	0.9219	0.8497	0.7515	0.6331	0.5044	0.3770
	5	1	0.9999	0.9986	0.9936	0.9803	0.9527	0.9051	0.8338	0.7384	0.6230
	6	1	1	0.9999	0.9991	0.9965	0.9894	0.9740	0.9452	0.8980	0.8281
	7	1	1	1	0.9999	0.9996	0.9984	0.9952	0.9877	0.9726	0.9453
	8	1	1	1	1	1	0.9999	0.9995	0.9983	0.9955	0.9893
	9	1	1	1	1	1	1	1	0.9999	0.9997	0.9990
11	0	0.5688	0.3138	0.1673	0.0859	0.0422	0.0198	0.0088	0.0036	0.0014	0.0005
	1	0.8981	0.6974	0.4922	0.3221	0.1971	0.1130	0.0606	0.0302	0.0139	0.0059
	2	0.9848	0.9104	0.7788	0.6174	0.4552	0.3127	0.2001	0.1189	0.0652	0.0327
	3	0.9984	0.9815	0.9306	0.8389	0.7133	0.5696	0.4256	0.2963	0.1911	0.1133
	4	0.9999	0.9972	0.9841	0.9496	0.8854	0.7897	0.6683	0.5328	0.3971	0.2744
	5	1	0.9997	0.9973	0.9883	0.9657	0.9218	0.8513	0.7535	0.6331	0.5000
	6	1	1	0.9997	0.9980	0.9924	0.9784	0.9499	0.9006	0.8262	0.7256
	7	1	1	1	0.9998	0.9988	0.9957	0.9878	0.9707	0.9390	0.8867
	8	1	1	1	1	0.9999	0.9994	0.9980	0.9941	0.9852	0.9673
	9	1	1	1	1	1	1	0.9998	0.9993	0.9978	0.9941
	10	1	1	1	1	1	1	1	1	0.9998	0.9995
12	0	0.5404	0.2824	0.1422	0.0687	0.0317	0.0138	0.0057	0.0022	0.0008	0.0002
	1	0.8816	0.6590	0.4435	0.2749	0.1584	0.0850	0.0424	0.0196	0.0083	0.0032
	2	0.9804	0.8891	0.7358	0.5583	0.3907	0.2528	0.1513	0.0834	0.0421	0.0193
	3	0.9978	0.9744	0.9078	0.7946	0.6488	0.4925	0.3467	0.2253	0.1345	0.0730
	4	0.9998	0.9957	0.9761	0.9274	0.8424	0.7237	0.5833	0.4382	0.3044	0.1938
	5	1	0.9995	0.9954	0.9806	0.9456	0.8822	0.7873	0.6652	0.5269	0.3872
	6	1	0.9999	0.9993	0.9961	0.9857	0.9614	0.9154	0.8418	0.7393	0.6128
	7	1	1	0.9999	0.9994	0.9972	0.9905	0.9745	0.9427	0.8883	0.8062
	8	1	1	1	0.9999	0.9996	0.9983	0.9944	0.9847	0.9644	0.9270
	9	1	1	1	1	1	0.9998	0.9992	0.9972	0.9921	0.9807
	10	1	1	1	1	1	1	0.9999	0.9997	0.9989	0.9968
	11	1	1	1	1	1	1	1	1	0.9999	0.9998
13	0	0.5133	0.2542	0.1209	0.0550	0.0238	0.0097	0.0037	0.0013	0.0004	0.0001
	1	0.8646	0.6213	0.3983	0.2336	0.1267	0.0637	0.0296	0.0126	0.0049	0.0017
	2	0.9755	0.8661	0.6920	0.5017	0.3326	0.2025	0.1132	0.0579	0.0269	0.0112
	3	0.9969	0.9658	0.8820	0.7473	0.5843	0.4206	0.2783	0.1686	0.0929	0.0461
	4	0.9997	0.9935	0.9658	0.9009	0.7940	0.6543	0.5005	0.3530	0.2279	0.1334
	5	1	0.9991	0.9925	0.9700	0.9198	0.8346	0.7159	0.5744	0.4268	0.2905
	6	1	0.9999	0.9987	0.9930	0.9757	0.9376	0.8705	0.7712	0.6437	0.5000
	7	1	1	0.9998	0.9988	0.9944	0.9818	0.9538	0.9023	0.8212	0.7095
	8	1	1	1	0.9998	0.9990	0.9960	0.9874	0.9679	0.9302	0.8666
	9	1	1	1	1	0.9999	0.9993	0.9975	0.9922	0.9797	0.9539
	10	1	1	1	1	1	0.9999	0.9997	0.9987	0.9959	0.9888
	11	1	1	1	1	1	1	1	0.9999	0.9995	0.9983
	12	1	1	1	1	1	1	1	1	1	0.9999
14	0	0.4877	0.2288	0.1028	0.0440	0.0178	0.0068	0.0024	0.0008	0.0002	0.0001
	1	0.8470	0.5846	0.3567	0.1979	0.1010	0.0475	0.0205	0.0081	0.0029	0.0009
	2	0.9699	0.8416	0.6479	0.4481	0.2811	0.1608	0.0839	0.0398	0.0170	0.0065
	3	0.9958	0.9559	0.8535	0.6982	0.5213	0.3552	0.2205	0.1243	0.0632	0.0287
	4	0.9996	0.9908	0.9533	0.8702	0.7415	0.5842	0.4227	0.2793	0.1672	0.0898
	5	1	0.9985	0.9885	0.9561	0.8883	0.7805	0.6405	0.4859	0.3373	0.2120
	6	1	0.9998	0.9978	0.9884	0.9617	0.9067	0.8164	0.6925	0.5461	0.3953
	7	1	1	0.9997	0.9976	0.9897	0.9685	0.9247	0.8499	0.7414	0.6047
	8	1	1	1	0.9996	0.9978	0.9917	0.9757	0.9417	0.8811	0.7880
	9	1	1	1	1	0.9997	0.9983	0.9940	0.9825	0.9574	0.9102
	10	1	1	1	1	1	0.9998	0.9989	0.9961	0.9886	0.9713
	11	1	1	1	1	1	1	0.9999	0.9994	0.9978	0.9935
	12	1	1	1	1	1	1	1	0.9999	0.9997	0.9991
	13	1	1	1	1	1	1	1	1	1	0.9999

$\mathbb{P}(X \leq x)$ où $X \sim \mathcal{B}(n, p)$

		p									
n	x	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50
15	0	0.4633	0.2059	0.0874	0.0352	0.0134	0.0047	0.0016	0.0005	0.0001	0.0000
	1	0.8290	0.5490	0.3186	0.1671	0.0802	0.0353	0.0142	0.0052	0.0017	0.0005
	2	0.9638	0.8159	0.6042	0.3980	0.2361	0.1268	0.0617	0.0271	0.0107	0.0037
	3	0.9945	0.9444	0.8227	0.6482	0.4613	0.2969	0.1727	0.0905	0.0424	0.0176
	4	0.9994	0.9873	0.9383	0.8358	0.6865	0.5155	0.3519	0.2173	0.1204	0.0592
	5	0.9999	0.9978	0.9832	0.9389	0.8516	0.7216	0.5643	0.4032	0.2608	0.1509
	6	1	0.9997	0.9964	0.9819	0.9434	0.8689	0.7548	0.6098	0.4522	0.3036
	7	1	1	0.9994	0.9958	0.9827	0.9500	0.8868	0.7869	0.6535	0.5000
	8	1	1	0.9999	0.9992	0.9958	0.9848	0.9578	0.9050	0.8182	0.6964
	9	1	1	1	0.9999	0.9992	0.9963	0.9876	0.9662	0.9231	0.8491
	10	1	1	1	1	0.9999	0.9993	0.9972	0.9907	0.9745	0.9408
	11	1	1	1	1	1	0.9999	0.9995	0.9981	0.9937	0.9824
	12	1	1	1	1	1	1	0.9999	0.9997	0.9989	0.9963
	13	1	1	1	1	1	1	1	1	0.9999	0.9995
	14	1	1	1	1	1	1	1	1	1	1
16	0	0.4401	0.1853	0.0743	0.0281	0.0100	0.0033	0.0010	0.0003	0.0001	0.0000
	1	0.8108	0.5147	0.2839	0.1407	0.0635	0.0261	0.0098	0.0033	0.0010	0.0003
	2	0.9571	0.7892	0.5614	0.3518	0.1971	0.0994	0.0451	0.0183	0.0066	0.0021
	3	0.9930	0.9316	0.7899	0.5981	0.4050	0.2459	0.1339	0.0651	0.0281	0.0106
	4	0.9991	0.9830	0.9209	0.7982	0.6302	0.4499	0.2892	0.1666	0.0853	0.0384
	5	0.9999	0.9967	0.9765	0.9183	0.8103	0.6598	0.4900	0.3288	0.1976	0.1051
	6	1	0.9995	0.9944	0.9733	0.9204	0.8247	0.6881	0.5272	0.3660	0.2272
	7	1	0.9999	0.9989	0.9930	0.9729	0.9256	0.8406	0.7161	0.5629	0.4018
	8	1	1	0.9998	0.9985	0.9925	0.9743	0.9329	0.8577	0.7441	0.5982
	9	1	1	1	0.9998	0.9984	0.9929	0.9771	0.9417	0.8759	0.7728
	10	1	1	1	1	0.9997	0.9984	0.9938	0.9809	0.9514	0.8949
	11	1	1	1	1	1	0.9997	0.9987	0.9951	0.9851	0.9616
	12	1	1	1	1	1	1	0.9998	0.9991	0.9965	0.9894
	13	1	1	1	1	1	1	1	0.9999	0.9994	0.9979
	14	1	1	1	1	1	1	1	1	0.9999	0.9997
	15	1	1	1	1	1	1	1	1	1	1
17	0	0.4181	0.1668	0.0631	0.0225	0.0075	0.0023	0.0007	0.0002	0.0000	0.0000
	1	0.7922	0.4818	0.2525	0.1182	0.0501	0.0193	0.0067	0.0021	0.0006	0.0001
	2	0.9497	0.7618	0.5198	0.3096	0.1637	0.0774	0.0327	0.0123	0.0041	0.0012
	3	0.9912	0.9174	0.7556	0.5489	0.3530	0.2019	0.1028	0.0464	0.0184	0.0064
	4	0.9988	0.9779	0.9013	0.7582	0.5739	0.3887	0.2348	0.1260	0.0596	0.0245
	5	0.9999	0.9953	0.9681	0.8943	0.7653	0.5968	0.4197	0.2639	0.1471	0.0717
	6	1	0.9992	0.9917	0.9623	0.8929	0.7752	0.6188	0.4478	0.2902	0.1662
	7	1	0.9999	0.9983	0.9891	0.9598	0.8954	0.7872	0.6405	0.4743	0.3145
	8	1	1	0.9997	0.9974	0.9876	0.9597	0.9006	0.8011	0.6626	0.5000
	9	1	1	1	0.9995	0.9969	0.9873	0.9617	0.9081	0.8166	0.6855
	10	1	1	1	0.9999	0.9994	0.9968	0.9880	0.9652	0.9174	0.8338
	11	1	1	1	1	0.9999	0.9993	0.9970	0.9894	0.9699	0.9283
	12	1	1	1	1	1	0.9999	0.9994	0.9975	0.9914	0.9755
	13	1	1	1	1	1	1	0.9999	0.9995	0.9981	0.9936
	14	1	1	1	1	1	1	1	0.9999	0.9997	0.9988
	15	1	1	1	1	1	1	1	1	1	0.9999
	16	1	1	1	1	1	1	1	1	1	1
18	0	0.3972	0.1501	0.0536	0.0180	0.0056	0.0016	0.0004	0.0001	0.0000	0.0000
	1	0.7735	0.4503	0.2241	0.0991	0.0395	0.0142	0.0046	0.0013	0.0003	0.0001
	2	0.9419	0.7338	0.4797	0.2713	0.1353	0.0600	0.0236	0.0082	0.0025	0.0007
	3	0.9891	0.9018	0.7202	0.5010	0.3057	0.1646	0.0783	0.0328	0.0120	0.0038
	4	0.9985	0.9718	0.8794	0.7164	0.5187	0.3327	0.1886	0.0942	0.0411	0.0154
	5	0.9998	0.9936	0.9581	0.8671	0.7175	0.5344	0.3550	0.2088	0.1077	0.0481
	6	1	0.9988	0.9882	0.9487	0.8610	0.7217	0.5491	0.3743	0.2258	0.1189
	7	1	0.9998	0.9973	0.9837	0.9431	0.8593	0.7283	0.5634	0.3915	0.2403
	8	1	1	0.9995	0.9957	0.9807	0.9404	0.8609	0.7368	0.5778	0.4073
	9	1	1	0.9999	0.9991	0.9946	0.9790	0.9403	0.8653	0.7473	0.5927
	10	1	1	1	0.9998	0.9988	0.9939	0.9788	0.9424	0.8720	0.7597
	11	1	1	1	1	0.9998	0.9986	0.9938	0.9797	0.9463	0.8811
	12	1	1	1	1	1	0.9997	0.9986	0.9942	0.9817	0.9519
	13	1	1	1	1	1	1	0.9997	0.9987	0.9951	0.9846
	14	1	1	1	1	1	1	1	0.9998	0.9990	0.9962
	15	1	1	1	1	1	1	1	1	0.9999	0.9993
	16	1	1	1	1	1	1	1	1	1	0.9999
	17	1	1	1	1	1	1	1	1	1	1

$\mathbb{P}(X \leq x)$ où $X \sim \mathcal{B}(n,p)$

		p									
n	x	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50
19	0	0.3774	0.1351	0.0456	0.0144	0.0042	0.0011	0.0003	0.0001	0.0000	0.0000
	1	0.7547	0.4203	0.1985	0.0829	0.0310	0.0104	0.0031	0.0008	0.0002	0.0000
	2	0.9335	0.7054	0.4413	0.2369	0.1113	0.0462	0.0170	0.0055	0.0015	0.0004
	3	0.9868	0.8850	0.6841	0.4551	0.2631	0.1332	0.0591	0.0230	0.0077	0.0022
	4	0.9980	0.9648	0.8556	0.6733	0.4654	0.2822	0.1500	0.0696	0.0280	0.0096
	5	0.9998	0.9914	0.9463	0.8369	0.6678	0.4739	0.2968	0.1629	0.0777	0.0318
	6	1	0.9983	0.9837	0.9324	0.8251	0.6655	0.4812	0.3081	0.1727	0.0835
	7	1	0.9997	0.9959	0.9767	0.9225	0.8180	0.6656	0.4878	0.3169	0.1796
	8	1	1	0.9992	0.9933	0.9713	0.9161	0.8145	0.6675	0.4940	0.3238
	9	1	1	0.9999	0.9984	0.9911	0.9674	0.9125	0.8139	0.6710	0.5000
	10	1	1	1	0.9997	0.9977	0.9895	0.9653	0.9115	0.8159	0.6762
	11	1	1	1	1	0.9995	0.9972	0.9886	0.9648	0.9129	0.8204
	12	1	1	1	1	0.9999	0.9994	0.9969	0.9884	0.9658	0.9165
	13	1	1	1	1	1	0.9999	0.9993	0.9969	0.9891	0.9682
	14	1	1	1	1	1	1	0.9999	0.9994	0.9972	0.9904
	15	1	1	1	1	1	1	1	0.9999	0.9995	0.9978
	16	1	1	1	1	1	1	1	1	0.9999	0.9996
	17	1	1	1	1	1	1	1	1	1	1
	18	1	1	1	1	1	1	1	1	1	1
20	0	0.3585	0.1216	0.0388	0.0115	0.0032	0.0008	0.0002	0.0000	0.0000	0.0000
	1	0.7358	0.3917	0.1756	0.0692	0.0243	0.0076	0.0021	0.0005	0.0001	0.0000
	2	0.9245	0.6769	0.4049	0.2061	0.0913	0.0355	0.0121	0.0036	0.0009	0.0002
	3	0.9841	0.8670	0.6477	0.4114	0.2252	0.1071	0.0444	0.0160	0.0049	0.0013
	4	0.9974	0.9568	0.8298	0.6296	0.4148	0.2375	0.1182	0.0510	0.0189	0.0059
	5	0.9997	0.9887	0.9327	0.8042	0.6172	0.4164	0.2454	0.1256	0.0553	0.0207
	6	1	0.9976	0.9781	0.9133	0.7858	0.6080	0.4166	0.2500	0.1299	0.0577
	7	1	0.9996	0.9941	0.9679	0.8982	0.7723	0.6010	0.4159	0.2520	0.1316
	8	1	0.9999	0.9987	0.9900	0.9591	0.8867	0.7624	0.5956	0.4143	0.2517
	9	1	1	0.9998	0.9974	0.9861	0.9520	0.8782	0.7553	0.5914	0.4119
	10	1	1	1	0.9994	0.9961	0.9829	0.9468	0.8725	0.7507	0.5881
	11	1	1	1	0.9999	0.9991	0.9949	0.9804	0.9435	0.8692	0.7483
	12	1	1	1	1	0.9998	0.9987	0.9940	0.9790	0.9420	0.8684
	13	1	1	1	1	1	0.9997	0.9985	0.9935	0.9786	0.9423
	14	1	1	1	1	1	1	0.9997	0.9984	0.9936	0.9793
	15	1	1	1	1	1	1	1	0.9997	0.9985	0.9941
	16	1	1	1	1	1	1	1	1	0.9997	0.9987
	17	1	1	1	1	1	1	1	1	1	0.9998
	18	1	1	1	1	1	1	1	1	1	1
	19	1	1	1	1	1	1	1	1	1	1
21	0	0.3406	0.1094	0.0329	0.0092	0.0024	0.0006	0.0001	0.0000	0.0000	0.0000
	1	0.7170	0.3647	0.1550	0.0576	0.0190	0.0056	0.0014	0.0003	0.0001	0.0000
	2	0.9151	0.6484	0.3705	0.1787	0.0745	0.0271	0.0086	0.0024	0.0006	0.0001
	3	0.9811	0.8480	0.6113	0.3704	0.1917	0.0856	0.0331	0.0110	0.0031	0.0007
	4	0.9968	0.9478	0.8025	0.5860	0.3674	0.1984	0.0924	0.0370	0.0126	0.0036
	5	0.9996	0.9856	0.9173	0.7693	0.5666	0.3627	0.2009	0.0957	0.0389	0.0133
	6	1	0.9967	0.9713	0.8915	0.7436	0.5505	0.3567	0.2002	0.0964	0.0392
	7	1	0.9994	0.9917	0.9569	0.8701	0.7230	0.5365	0.3495	0.1971	0.0946
	8	1	0.9999	0.9980	0.9856	0.9439	0.8523	0.7059	0.5237	0.3413	0.1917
	9	1	1	0.9996	0.9959	0.9794	0.9324	0.8377	0.6914	0.5117	0.3318
	10	1	1	0.9999	0.9990	0.9936	0.9736	0.9228	0.8256	0.6790	0.5000
	11	1	1	1	0.9998	0.9983	0.9913	0.9687	0.9151	0.8159	0.6682
	12	1	1	1	1	0.9996	0.9976	0.9892	0.9648	0.9092	0.8083
	13	1	1	1	1	0.9999	0.9994	0.9969	0.9877	0.9621	0.9054
	14	1	1	1	1	1	0.9999	0.9993	0.9964	0.9868	0.9608
	15	1	1	1	1	1	1	0.9999	0.9992	0.9963	0.9867
	16	1	1	1	1	1	1	1	0.9998	0.9992	0.9964
	17	1	1	1	1	1	1	1	1	0.9999	0.9993
	18	1	1	1	1	1	1	1	1	1	0.9999
	19	1	1	1	1	1	1	1	1	1	1
	20	1	1	1	1	1	1	1	1	1	1

$\mathbb{P}(X \leq x)$ où $X \sim \mathcal{B}(n,p)$

		p									
n	x	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50
22	0	0.3235	0.0985	0.0280	0.0074	0.0018	0.0004	0.0001	0.0000	0.0000	0.0000
	1	0.6982	0.3392	0.1367	0.0480	0.0149	0.0041	0.0010	0.0002	0.0000	0.0000
	2	0.9052	0.6200	0.3382	0.1545	0.0606	0.0207	0.0061	0.0016	0.0003	0.0001
	3	0.9778	0.8281	0.5752	0.3320	0.1624	0.0681	0.0245	0.0076	0.0020	0.0004
	4	0.9960	0.9379	0.7738	0.5429	0.3235	0.1645	0.0716	0.0266	0.0083	0.0022
	5	0.9994	0.9818	0.9001	0.7326	0.5168	0.3134	0.1629	0.0722	0.0271	0.0085
	6	0.9999	0.9956	0.9632	0.8670	0.6994	0.4942	0.3022	0.1584	0.0705	0.0262
	7	1	0.9991	0.9886	0.9439	0.8385	0.6713	0.4736	0.2898	0.1518	0.0669
	8	1	0.9999	0.9970	0.9799	0.9254	0.8135	0.6466	0.4540	0.2764	0.1431
	9	1	1	0.9993	0.9939	0.9705	0.9084	0.7916	0.6244	0.4350	0.2617
	10	1	1	0.9999	0.9984	0.9900	0.9613	0.8930	0.7720	0.6037	0.4159
	11	1	1	1	0.9997	0.9971	0.9860	0.9526	0.8793	0.7543	0.5841
	12	1	1	1	0.9999	0.9993	0.9957	0.9820	0.9449	0.8672	0.7383
	13	1	1	1	1	0.9999	0.9989	0.9942	0.9785	0.9383	0.8569
	14	1	1	1	1	1	0.9998	0.9984	0.9930	0.9757	0.9331
	15	1	1	1	1	1	1	0.9997	0.9981	0.9920	0.9738
	16	1	1	1	1	1	1	0.9999	0.9996	0.9979	0.9915
	17	1	1	1	1	1	1	1	0.9999	0.9995	0.9978
	18	1	1	1	1	1	1	1	1	0.9999	0.9996
	19	1	1	1	1	1	1	1	1	1	0.9999
	20	1	1	1	1	1	1	1	1	1	1
	21	1	1	1	1	1	1	1	1	1	1
23	0	0.3074	0.0886	0.0238	0.0059	0.0013	0.0003	0.0000	0.0000	0.0000	0.0000
	1	0.6794	0.3151	0.1204	0.0398	0.0116	0.0030	0.0007	0.0001	0.0000	0.0000
	2	0.8948	0.5920	0.3080	0.1332	0.0492	0.0157	0.0043	0.0010	0.0002	0.0000
	3	0.9742	0.8073	0.5396	0.2965	0.1370	0.0538	0.0181	0.0052	0.0012	0.0002
	4	0.9951	0.9269	0.7440	0.5007	0.2832	0.1356	0.0551	0.0190	0.0055	0.0013
	5	0.9992	0.9774	0.8811	0.6947	0.4685	0.2688	0.1309	0.0540	0.0186	0.0053
	6	0.9999	0.9942	0.9537	0.8402	0.6537	0.4399	0.2534	0.1240	0.0510	0.0173
	7	1	0.9988	0.9848	0.9285	0.8037	0.6181	0.4136	0.2373	0.1152	0.0466
	8	1	0.9998	0.9958	0.9727	0.9037	0.7709	0.5860	0.3884	0.2203	0.1050
	9	1	1	0.9990	0.9911	0.9592	0.8799	0.7408	0.5562	0.3636	0.2024
	10	1	1	0.9998	0.9975	0.9851	0.9454	0.8575	0.7129	0.5278	0.3388
	11	1	1	1	0.9994	0.9954	0.9786	0.9318	0.8364	0.6865	0.5000
	12	1	1	1	0.9999	0.9988	0.9928	0.9717	0.9187	0.8164	0.6612
	13	1	1	1	1	0.9997	0.9979	0.9900	0.9651	0.9063	0.7976
	14	1	1	1	1	0.9999	0.9995	0.9970	0.9872	0.9589	0.8950
	15	1	1	1	1	1	0.9999	0.9992	0.9960	0.9847	0.9534
	16	1	1	1	1	1	1	0.9998	0.9990	0.9952	0.9827
	17	1	1	1	1	1	1	1	0.9998	0.9988	0.9947
	18	1	1	1	1	1	1	1	1	0.9998	0.9987
	19	1	1	1	1	1	1	1	1	1	0.9998
	20	1	1	1	1	1	1	1	1	1	1
	21	1	1	1	1	1	1	1	1	1	1
	22	1	1	1	1	1	1	1	1	1	1
24	0	0.2920	0.0798	0.0202	0.0047	0.0010	0.0002	0.0000	0.0000	0.0000	0.0000
	1	0.6608	0.2925	0.1059	0.0331	0.0090	0.0022	0.0005	0.0001	0.0000	0.0000
	2	0.8841	0.5643	0.2798	0.1145	0.0398	0.0119	0.0030	0.0007	0.0001	0.0000
	3	0.9702	0.7857	0.5049	0.2639	0.1150	0.0424	0.0133	0.0035	0.0008	0.0001
	4	0.9940	0.9149	0.7134	0.4599	0.2466	0.1111	0.0422	0.0134	0.0036	0.0008
	5	0.9990	0.9723	0.8606	0.6559	0.4222	0.2288	0.1044	0.0400	0.0127	0.0033
	6	0.9999	0.9925	0.9428	0.8111	0.6074	0.3886	0.2106	0.0960	0.0364	0.0113
	7	1	0.9983	0.9801	0.9108	0.7662	0.5647	0.3575	0.1919	0.0863	0.0320
	8	1	0.9997	0.9941	0.9638	0.8787	0.7250	0.5257	0.3279	0.1730	0.0758
	9	1	0.9999	0.9985	0.9874	0.9453	0.8472	0.6866	0.4891	0.2991	0.1537
	10	1	1	0.9997	0.9962	0.9787	0.9258	0.8167	0.6502	0.4539	0.2706
	11	1	1	0.9999	0.9990	0.9928	0.9686	0.9058	0.7870	0.6151	0.4194
	12	1	1	1	0.9998	0.9979	0.9885	0.9577	0.8857	0.7580	0.5806
	13	1	1	1	1	0.9995	0.9964	0.9836	0.9465	0.8659	0.7294
	14	1	1	1	1	0.9999	0.9990	0.9945	0.9783	0.9352	0.8463
	15	1	1	1	1	1	0.9998	0.9984	0.9925	0.9731	0.9242
	16	1	1	1	1	1	1	0.9996	0.9978	0.9905	0.9680
	17	1	1	1	1	1	1	0.9999	0.9995	0.9972	0.9887
	18	1	1	1	1	1	1	1	0.9999	0.9993	0.9967
	19	1	1	1	1	1	1	1	1	0.9999	0.9992
	20	1	1	1	1	1	1	1	1	1	0.9999
	21	1	1	1	1	1	1	1	1	1	1
	22	1	1	1	1	1	1	1	1	1	1
	23	1	1	1	1	1	1	1	1	1	1

$\mathbb{P}(X \leq x)$ où $X \sim \mathcal{B}(n,p)$

		p									
n	x	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50
25	0	0.2774	0.0718	0.0172	0.0038	0.0008	0.0001	0.0000	0.0000	0.0000	0.0000
	1	0.6424	0.2712	0.0931	0.0274	0.0070	0.0016	0.0003	0.0001	0.0000	0.0000
	2	0.8729	0.5371	0.2537	0.0982	0.0321	0.0090	0.0021	0.0004	0.0001	0.0000
	3	0.9659	0.7636	0.4711	0.2340	0.0962	0.0332	0.0097	0.0024	0.0005	0.0001
	4	0.9928	0.9020	0.6821	0.4207	0.2137	0.0905	0.0320	0.0095	0.0023	0.0005
	5	0.9988	0.9666	0.8385	0.6167	0.3783	0.1935	0.0826	0.0294	0.0086	0.0020
	6	0.9998	0.9905	0.9305	0.7800	0.5611	0.3407	0.1734	0.0736	0.0258	0.0073
	7	1	0.9977	0.9745	0.8909	0.7265	0.5118	0.3061	0.1536	0.0639	0.0216
	8	1	0.9995	0.9920	0.9532	0.8506	0.6769	0.4668	0.2735	0.1340	0.0539
	9	1	0.9999	0.9979	0.9827	0.9287	0.8106	0.6303	0.4246	0.2424	0.1148
	10	1	1	0.9995	0.9944	0.9703	0.9022	0.7712	0.5858	0.3843	0.2122
	11	1	1	0.9999	0.9985	0.9893	0.9558	0.8746	0.7323	0.5426	0.3450
	12	1	1	1	0.9996	0.9966	0.9825	0.9396	0.8462	0.6937	0.5000
	13	1	1	1	0.9999	0.9991	0.9940	0.9745	0.9222	0.8173	0.6550
	14	1	1	1	1	0.9998	0.9982	0.9907	0.9656	0.9040	0.7878
	15	1	1	1	1	1	0.9995	0.9971	0.9868	0.9560	0.8852
	16	1	1	1	1	1	0.9999	0.9992	0.9957	0.9826	0.9461
	17	1	1	1	1	1	1	0.9998	0.9988	0.9942	0.9784
	18	1	1	1	1	1	1	1	0.9997	0.9984	0.9927
	19	1	1	1	1	1	1	1	0.9999	0.9996	0.9980
	20	1	1	1	1	1	1	1	1	0.9999	0.9995
	21	1	1	1	1	1	1	1	1	1	0.9999
	22	1	1	1	1	1	1	1	1	1	1
	23	1	1	1	1	1	1	1	1	1	1
	24	1	1	1	1	1	1	1	1	1	1
30	0	0.2146	0.0424	0.0076	0.0012	0.0002	0.0000	0.0000	0.0000	0.0000	0.0000
	1	0.5535	0.1837	0.0480	0.0105	0.0020	0.0003	0.0000	0.0000	0.0000	0.0000
	2	0.8122	0.4114	0.1514	0.0442	0.0106	0.0021	0.0003	0.0000	0.0000	0.0000
	3	0.9392	0.6474	0.3217	0.1227	0.0374	0.0093	0.0019	0.0003	0.0000	0.0000
	4	0.9844	0.8245	0.5245	0.2552	0.0979	0.0302	0.0075	0.0015	0.0002	0.0000
	5	0.9967	0.9268	0.7106	0.4275	0.2026	0.0766	0.0233	0.0057	0.0011	0.0002
	6	0.9994	0.9742	0.8474	0.6070	0.3481	0.1595	0.0586	0.0172	0.0040	0.0007
	7	0.9999	0.9922	0.9302	0.7608	0.5143	0.2814	0.1238	0.0435	0.0121	0.0026
	8	1	0.9980	0.9722	0.8713	0.6736	0.4315	0.2247	0.0940	0.0312	0.0081
	9	1	0.9995	0.9903	0.9389	0.8034	0.5888	0.3575	0.1763	0.0694	0.0214
	10	1	0.9999	0.9971	0.9744	0.8943	0.7304	0.5078	0.2915	0.1350	0.0494
	11	1	1	0.9992	0.9905	0.9493	0.8407	0.6548	0.4311	0.2327	0.1002
	12	1	1	0.9998	0.9969	0.9784	0.9155	0.7802	0.5785	0.3592	0.1808
	13	1	1	1	0.9991	0.9918	0.9599	0.8737	0.7145	0.5025	0.2923
	14	1	1	1	0.9998	0.9973	0.9831	0.9348	0.8246	0.6448	0.4278
	15	1	1	1	0.9999	0.9992	0.9936	0.9699	0.9029	0.7691	0.5722
	16	1	1	1	1	0.9998	0.9979	0.9876	0.9519	0.8644	0.7077
	17	1	1	1	1	0.9999	0.9994	0.9955	0.9788	0.9286	0.8192
	18	1	1	1	1	1	0.9998	0.9986	0.9917	0.9666	0.8998
	19	1	1	1	1	1	1	0.9996	0.9971	0.9862	0.9506
	20	1	1	1	1	1	1	0.9999	0.9991	0.9950	0.9786
	21	1	1	1	1	1	1	1	0.9998	0.9984	0.9919
	22	1	1	1	1	1	1	1	1	0.9996	0.9974
	23	1	1	1	1	1	1	1	1	0.9999	0.9993
	24	1	1	1	1	1	1	1	1	1	0.9998
	25	1	1	1	1	1	1	1	1	1	1
	à	1	1	1	1	1	1	1	1	1	1
	29	1	1	1	1	1	1	1	1	1	1

$\mathbb{P}(X \leq x)$ où $X \sim \mathcal{B}(n,p)$

		p									
n	x	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50
35	0	0.1661	0.0250	0.0034	0.0004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	1	0.4720	0.1224	0.0243	0.0040	0.0005	0.0001	0.0000	0.0000	0.0000	0.0000
	2	0.7458	0.3063	0.0870	0.0190	0.0033	0.0005	0.0001	0.0000	0.0000	0.0000
	3	0.9042	0.5310	0.2088	0.0605	0.0136	0.0024	0.0003	0.0000	0.0000	0.0000
	4	0.9710	0.7307	0.3807	0.1435	0.0410	0.0091	0.0016	0.0002	0.0000	0.0000
	5	0.9927	0.8684	0.5689	0.2721	0.0976	0.0269	0.0058	0.0010	0.0001	0.0000
	6	0.9985	0.9448	0.7348	0.4328	0.1920	0.0650	0.0170	0.0034	0.0005	0.0001
	7	0.9997	0.9800	0.8562	0.5993	0.3223	0.1326	0.0419	0.0102	0.0019	0.0003
	8	1	0.9937	0.9311	0.7450	0.4743	0.2341	0.0890	0.0260	0.0057	0.0009
	9	1	0.9983	0.9708	0.8543	0.6263	0.3646	0.1651	0.0575	0.0152	0.0030
	10	1	0.9996	0.9890	0.9253	0.7581	0.5100	0.2716	0.1123	0.0354	0.0083
	11	1	0.9999	0.9963	0.9656	0.8579	0.6516	0.4019	0.1952	0.0729	0.0205
	12	1	1	0.9989	0.9858	0.9244	0.7729	0.5423	0.3057	0.1344	0.0448
	13	1	1	0.9997	0.9947	0.9637	0.8650	0.6760	0.4361	0.2233	0.0877
	14	1	1	0.9999	0.9982	0.9842	0.9269	0.7891	0.5728	0.3376	0.1553
	15	1	1	1	0.9995	0.9938	0.9641	0.8744	0.7003	0.4685	0.2498
	16	1	1	1	0.9999	0.9978	0.9840	0.9318	0.8065	0.6024	0.3679
	17	1	1	1	1	0.9993	0.9936	0.9664	0.8857	0.7249	0.5000
	18	1	1	1	1	0.9998	0.9977	0.9850	0.9385	0.8251	0.6321
	19	1	1	1	1	0.9999	0.9992	0.9939	0.9700	0.8984	0.7502
	20	1	1	1	1	1	0.9998	0.9978	0.9867	0.9464	0.8447
	21	1	1	1	1	1	0.9999	0.9993	0.9947	0.9745	0.9123
	22	1	1	1	1	1	1	0.9998	0.9981	0.9891	0.9552
	23	1	1	1	1	1	1	0.9999	0.9994	0.9958	0.9795
	24	1	1	1	1	1	1	1	0.9998	0.9986	0.9917
	25	1	1	1	1	1	1	1	1	0.9996	0.9970
	26	1	1	1	1	1	1	1	1	0.9999	0.9991
	27	1	1	1	1	1	1	1	1	1	0.9997
	28	1	1	1	1	1	1	1	1	1	0.9999
	29	1	1	1	1	1	1	1	1	1	1
	à	1	1	1	1	1	1	1	1	1	1
	34	1	1	1	1	1	1	1	1	1	1
40	0	0.1285	0.0148	0.0015	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	1	0.3991	0.0805	0.0121	0.0015	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
	2	0.6767	0.2228	0.0486	0.0079	0.0010	0.0001	0.0000	0.0000	0.0000	0.0000
	3	0.8619	0.4231	0.1302	0.0285	0.0047	0.0006	0.0001	0.0000	0.0000	0.0000
	4	0.9520	0.6290	0.2633	0.0759	0.0160	0.0026	0.0003	0.0000	0.0000	0.0000
	5	0.9861	0.7937	0.4325	0.1613	0.0433	0.0086	0.0013	0.0001	0.0000	0.0000
	6	0.9966	0.9005	0.6067	0.2859	0.0962	0.0238	0.0044	0.0006	0.0001	0.0000
	7	0.9993	0.9581	0.7559	0.4371	0.1820	0.0553	0.0124	0.0021	0.0002	0.0000
	8	0.9999	0.9845	0.8646	0.5931	0.2998	0.1110	0.0303	0.0061	0.0009	0.0001
	9	1	0.9949	0.9328	0.7318	0.4395	0.1959	0.0644	0.0156	0.0027	0.0003
	10	1	0.9985	0.9701	0.8392	0.5839	0.3087	0.1215	0.0352	0.0074	0.0011
	11	1	0.9996	0.9880	0.9125	0.7151	0.4406	0.2053	0.0709	0.0179	0.0032
	12	1	0.9999	0.9957	0.9568	0.8209	0.5772	0.3143	0.1285	0.0386	0.0083
	13	1	1	0.9986	0.9806	0.8968	0.7032	0.4408	0.2112	0.0751	0.0192
	14	1	1	0.9996	0.9921	0.9456	0.8074	0.5721	0.3174	0.1326	0.0403
	15	1	1	0.9999	0.9971	0.9738	0.8849	0.6946	0.4402	0.2142	0.0769
	16	1	1	1	0.9990	0.9884	0.9367	0.7978	0.5681	0.3185	0.1341
	17	1	1	1	0.9997	0.9953	0.9680	0.8761	0.6885	0.4391	0.2148
	18	1	1	1	0.9999	0.9983	0.9852	0.9301	0.7911	0.5651	0.3179
	19	1	1	1	1	0.9994	0.9937	0.9637	0.8702	0.6844	0.4373
	20	1	1	1	1	0.9998	0.9976	0.9827	0.9256	0.7870	0.5627
	21	1	1	1	1	1	0.9991	0.9925	0.9608	0.8669	0.6821
	22	1	1	1	1	1	0.9997	0.9970	0.9811	0.9233	0.7852
	23	1	1	1	1	1	0.9999	0.9989	0.9917	0.9595	0.8659
	24	1	1	1	1	1	1	0.9996	0.9966	0.9804	0.9231
	25	1	1	1	1	1	1	0.9999	0.9988	0.9914	0.9597
	26	1	1	1	1	1	1	1	0.9996	0.9966	0.9808
	27	1	1	1	1	1	1	1	0.9999	0.9988	0.9917
	28	1	1	1	1	1	1	1	1	0.9996	0.9968
	29	1	1	1	1	1	1	1	1	0.9999	0.9989
	30	1	1	1	1	1	1	1	1	1	0.9997
	31	1	1	1	1	1	1	1	1	1	0.9999
	32	1	1	1	1	1	1	1	1	1	1
	à	1	1	1	1	1	1	1	1	1	1
	39	1	1	1	1	1	1	1	1	1	1

$$\mathbb{P}(X \leq x) \text{ où } X \sim \mathcal{B}(n,p)$$

		p									
n	x	.05	.10	.15	.20	.25	.30	.35	.40	.45	.50
45	0	0.0994	0.0087	0.0007	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	1	0.3350	0.0524	0.0060	0.0005	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	2	0.6077	0.1590	0.0265	0.0032	0.0003	0.0000	0.0000	0.0000	0.0000	0.0000
	3	0.8134	0.3289	0.0785	0.0129	0.0016	0.0001	0.0000	0.0000	0.0000	0.0000
	4	0.9271	0.5271	0.1748	0.0382	0.0059	0.0007	0.0001	0.0000	0.0000	0.0000
	5	0.9761	0.7077	0.3142	0.0902	0.0179	0.0026	0.0003	0.0000	0.0000	0.0000
	6	0.9934	0.8415	0.4782	0.1768	0.0446	0.0080	0.0010	0.0001	0.0000	0.0000
	7	0.9984	0.9243	0.6394	0.2975	0.0941	0.0209	0.0033	0.0004	0.0000	0.0000
	8	0.9997	0.9680	0.7745	0.4407	0.1725	0.0471	0.0091	0.0012	0.0001	0.0000
	9	0.9999	0.9880	0.8726	0.5880	0.2800	0.0934	0.0220	0.0036	0.0004	0.0000
	10	1	0.9960	0.9349	0.7205	0.4089	0.1647	0.0469	0.0094	0.0013	0.0001
	11	1	0.9988	0.9698	0.8259	0.5457	0.2620	0.0896	0.0216	0.0036	0.0004
	12	1	0.9997	0.9873	0.9005	0.6748	0.3802	0.1547	0.0446	0.0090	0.0012
	13	1	0.9999	0.9952	0.9479	0.7841	0.5088	0.2437	0.0836	0.0201	0.0033
	14	1	1	0.9983	0.9750	0.8673	0.6347	0.3533	0.1430	0.0409	0.0080
	15	1	1	0.9995	0.9890	0.9247	0.7462	0.4752	0.2249	0.0762	0.0178
	16	1	1	0.9998	0.9956	0.9605	0.8358	0.5983	0.3272	0.1302	0.0362
	17	1	1	1	0.9983	0.9809	0.9014	0.7113	0.4436	0.2056	0.0676
	18	1	1	1	0.9994	0.9915	0.9451	0.8060	0.5643	0.3015	0.1163
	19	1	1	1	0.9998	0.9965	0.9717	0.8785	0.6786	0.4131	0.1856
	20	1	1	1	0.9999	0.9987	0.9865	0.9292	0.7777	0.5318	0.2757
	21	1	1	1	1	0.9995	0.9940	0.9618	0.8564	0.6474	0.3830
	22	1	1	1	1	0.9999	0.9976	0.9809	0.9135	0.7506	0.5000
	23	1	1	1	1	1	0.9991	0.9911	0.9517	0.8350	0.6170
	24	1	1	1	1	1	0.9997	0.9962	0.9750	0.8983	0.7243
	25	1	1	1	1	1	0.9999	0.9985	0.9880	0.9418	0.8144
	26	1	1	1	1	1	1	0.9995	0.9947	0.9692	0.8837
	27	1	1	1	1	1	1	0.9998	0.9979	0.9850	0.9324
	28	1	1	1	1	1	1	0.9999	0.9992	0.9932	0.9638
	29	1	1	1	1	1	1	1	0.9997	0.9972	0.9822
	30	1	1	1	1	1	1	1	0.9999	0.9990	0.9920
	31	1	1	1	1	1	1	1	1	0.9996	0.9967
	32	1	1	1	1	1	1	1	1	0.9999	0.9988
	33	1	1	1	1	1	1	1	1	1	0.9996
	34	1	1	1	1	1	1	1	1	1	0.9999
	35	1	1	1	1	1	1	1	1	1	1
	à	1	1	1	1	1	1	1	1	1	1
	44	1	1	1	1	1	1	1	1	1	1

1.2 Fonction de répartition de la loi de Poisson

Si $X \sim \mathcal{P}(\lambda)$, alors $\mathbb{P}(X = x) = e^{-\lambda}\frac{\lambda^x}{x!}$ pour $x \in \mathbb{N}$, $\mathbb{E}(X) = \lambda$ et $\mathrm{Var}(X) = \lambda$. La table qui suit donne la fonction de répartition pour des valeurs de λ allant de 0 à 20. Pour les valeurs supérieures à 20, on pourra utiliser l'approximation (grossière) gaussienne : $\mathbb{P}(X \leq x) \simeq \Phi\left(\frac{x+0.5-\lambda}{\sqrt{\lambda}}\right)$ où Φ est la fonction de répartition de la loi normale centrée réduite.

$\mathbb{P}(X \leq x)$ où $X \sim \mathcal{P}(\lambda)$

	λ									
x	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0	0.9048	0.8187	0.7408	0.6703	0.6065	0.5488	0.4966	0.4493	0.4066	0.3679
1	0.9953	0.9825	0.9631	0.9384	0.9098	0.8781	0.8442	0.8088	0.7725	0.7358
2	0.9998	0.9989	0.9964	0.9921	0.9856	0.9769	0.9659	0.9526	0.9371	0.9197
3	1	0.9999	0.9997	0.9992	0.9982	0.9966	0.9942	0.9909	0.9865	0.9810
4	1	1	1	0.9999	0.9998	0.9996	0.9992	0.9986	0.9977	0.9963
5	1	1	1	1	1	1	0.9999	0.9998	0.9997	0.9994
6	1	1	1	1	1	1	1	1	1	0.9999
7	1	1	1	1	1	1	1	1	1	1

$\mathbb{P}(X \leq x)$ où $X \sim \mathcal{P}(\lambda)$

	λ									
x	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	2.0
0	0.3329	0.3012	0.2725	0.2466	0.2231	0.2019	0.1827	0.1653	0.1496	0.1353
1	0.6990	0.6626	0.6268	0.5918	0.5578	0.5249	0.4932	0.4628	0.4337	0.4060
2	0.9004	0.8795	0.8571	0.8335	0.8088	0.7834	0.7572	0.7306	0.7037	0.6767
3	0.9743	0.9662	0.9569	0.9463	0.9344	0.9212	0.9068	0.8913	0.8747	0.8571
4	0.9946	0.9923	0.9893	0.9857	0.9814	0.9763	0.9704	0.9636	0.9559	0.9473
5	0.9990	0.9985	0.9978	0.9968	0.9955	0.9940	0.9920	0.9896	0.9868	0.9834
6	0.9999	0.9997	0.9996	0.9994	0.9991	0.9987	0.9981	0.9974	0.9966	0.9955
7	1	1	0.9999	0.9999	0.9998	0.9997	0.9996	0.9994	0.9992	0.9989
8	1	1	1	1	1	1	0.9999	0.9999	0.9998	0.9998
9	1	1	1	1	1	1	1	1	1	1

$\mathbb{P}(X \leq x)$ où $X \sim \mathcal{P}(\lambda)$

	λ									
x	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3.0
0	0.1225	0.1108	0.1003	0.0907	0.0821	0.0743	0.0672	0.0608	0.0550	0.0498
1	0.3796	0.3546	0.3309	0.3084	0.2873	0.2674	0.2487	0.2311	0.2146	0.1991
2	0.6496	0.6227	0.5960	0.5697	0.5438	0.5184	0.4936	0.4695	0.4460	0.4232
3	0.8386	0.8194	0.7993	0.7787	0.7576	0.7360	0.7141	0.6919	0.6696	0.6472
4	0.9379	0.9275	0.9162	0.9041	0.8912	0.8774	0.8629	0.8477	0.8318	0.8153
5	0.9796	0.9751	0.9700	0.9643	0.9580	0.9510	0.9433	0.9349	0.9258	0.9161
6	0.9941	0.9925	0.9906	0.9884	0.9858	0.9828	0.9794	0.9756	0.9713	0.9665
7	0.9985	0.9980	0.9974	0.9967	0.9958	0.9947	0.9934	0.9919	0.9901	0.9881
8	0.9997	0.9995	0.9994	0.9991	0.9989	0.9985	0.9981	0.9976	0.9969	0.9962
9	0.9999	0.9999	0.9999	0.9998	0.9997	0.9996	0.9995	0.9993	0.9991	0.9989
10	1	1	1	1	0.9999	0.9999	0.9999	0.9998	0.9998	0.9997
11	1	1	1	1	1	1	1	1	0.9999	0.9999
12	1	1	1	1	1	1	1	1	1	1

$\mathbb{P}(X \leq x)$ où $X \sim \mathcal{P}(\lambda)$

	λ									
x	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0
0	0.0450	0.0408	0.0369	0.0334	0.0302	0.0273	0.0247	0.0224	0.0202	0.0183
1	0.1847	0.1712	0.1586	0.1468	0.1359	0.1257	0.1162	0.1074	0.0992	0.0916
2	0.4012	0.3799	0.3594	0.3397	0.3208	0.3027	0.2854	0.2689	0.2531	0.2381
3	0.6248	0.6025	0.5803	0.5584	0.5366	0.5152	0.4942	0.4735	0.4532	0.4335
4	0.7982	0.7806	0.7626	0.7442	0.7254	0.7064	0.6872	0.6678	0.6484	0.6288
5	0.9057	0.8946	0.8829	0.8705	0.8576	0.8441	0.8301	0.8156	0.8006	0.7851
6	0.9612	0.9554	0.9490	0.9421	0.9347	0.9267	0.9182	0.9091	0.8995	0.8893
7	0.9858	0.9832	0.9802	0.9769	0.9733	0.9692	0.9648	0.9599	0.9546	0.9489
8	0.9953	0.9943	0.9931	0.9917	0.9901	0.9883	0.9863	0.9840	0.9815	0.9786
9	0.9986	0.9982	0.9978	0.9973	0.9967	0.9960	0.9952	0.9942	0.9931	0.9919
10	0.9996	0.9995	0.9994	0.9992	0.9990	0.9987	0.9984	0.9981	0.9977	0.9972
11	0.9999	0.9999	0.9998	0.9998	0.9997	0.9996	0.9995	0.9994	0.9993	0.9991
12	1	1	1	0.9999	0.9999	0.9999	0.9999	0.9998	0.9998	0.9997
13	1	1	1	1	1	1	1	1	0.9999	0.9999
14	1	1	1	1	1	1	1	1	1	1

$\mathbb{P}(X \leq x)$ où $X \sim \mathcal{P}(\lambda)$

	λ									
x	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0
0	0.0166	0.0150	0.0136	0.0123	0.0111	0.0101	0.0091	0.0082	0.0074	0.0067
1	0.0845	0.0780	0.0719	0.0663	0.0611	0.0563	0.0518	0.0477	0.0439	0.0404
2	0.2238	0.2102	0.1974	0.1851	0.1736	0.1626	0.1523	0.1425	0.1333	0.1247
3	0.4142	0.3954	0.3772	0.3594	0.3423	0.3257	0.3097	0.2942	0.2793	0.2650
4	0.6093	0.5898	0.5704	0.5512	0.5321	0.5132	0.4946	0.4763	0.4582	0.4405
5	0.7693	0.7531	0.7367	0.7199	0.7029	0.6858	0.6684	0.6510	0.6335	0.6160
6	0.8786	0.8675	0.8558	0.8436	0.8311	0.8180	0.8046	0.7908	0.7767	0.7622
7	0.9427	0.9361	0.9290	0.9214	0.9134	0.9049	0.8960	0.8867	0.8769	0.8666
8	0.9755	0.9721	0.9683	0.9642	0.9597	0.9549	0.9497	0.9442	0.9382	0.9319
9	0.9905	0.9889	0.9871	0.9851	0.9829	0.9805	0.9778	0.9749	0.9717	0.9682
10	0.9966	0.9959	0.9952	0.9943	0.9933	0.9922	0.9910	0.9896	0.9880	0.9863
11	0.9989	0.9986	0.9983	0.9980	0.9976	0.9971	0.9966	0.9960	0.9953	0.9945
12	0.9997	0.9996	0.9995	0.9993	0.9992	0.9990	0.9988	0.9986	0.9983	0.9980
13	0.9999	0.9999	0.9998	0.9998	0.9997	0.9997	0.9996	0.9995	0.9994	0.9993
14	1	1	1	0.9999	0.9999	0.9999	0.9999	0.9999	0.9998	0.9998
15	1	1	1	1	1	1	1	1	0.9999	0.9999
16	1	1	1	1	1	1	1	1	1	1

$\mathbb{P}(X \leq x)$ où $X \sim \mathcal{P}(\lambda)$

	λ									
x	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6.0
0	0.0061	0.0055	0.0050	0.0045	0.0041	0.0037	0.0033	0.0030	0.0027	0.0025
1	0.0372	0.0342	0.0314	0.0289	0.0266	0.0244	0.0224	0.0206	0.0189	0.0174
2	0.1165	0.1088	0.1016	0.0948	0.0884	0.0824	0.0768	0.0715	0.0666	0.0620
3	0.2513	0.2381	0.2254	0.2133	0.2017	0.1906	0.1800	0.1700	0.1604	0.1512
4	0.4231	0.4061	0.3895	0.3733	0.3575	0.3422	0.3272	0.3127	0.2987	0.2851
5	0.5984	0.5809	0.5635	0.5461	0.5289	0.5119	0.4950	0.4783	0.4619	0.4457
6	0.7474	0.7324	0.7171	0.7017	0.6860	0.6703	0.6544	0.6384	0.6224	0.6063
7	0.8560	0.8449	0.8335	0.8217	0.8095	0.7970	0.7841	0.7710	0.7576	0.7440
8	0.9252	0.9181	0.9106	0.9027	0.8944	0.8857	0.8766	0.8672	0.8574	0.8472
9	0.9644	0.9603	0.9559	0.9512	0.9462	0.9409	0.9352	0.9292	0.9228	0.9161
10	0.9844	0.9823	0.9800	0.9775	0.9747	0.9718	0.9686	0.9651	0.9614	0.9574
11	0.9937	0.9927	0.9916	0.9904	0.9890	0.9875	0.9859	0.9841	0.9821	0.9799
12	0.9976	0.9972	0.9967	0.9962	0.9955	0.9949	0.9941	0.9932	0.9922	0.9912
13	0.9992	0.9990	0.9988	0.9986	0.9983	0.9980	0.9977	0.9973	0.9969	0.9964
14	0.9997	0.9997	0.9996	0.9995	0.9994	0.9993	0.9991	0.9990	0.9988	0.9986
15	0.9999	0.9999	0.9999	0.9998	0.9998	0.9998	0.9997	0.9996	0.9996	0.9995
16	1	1	1	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9998
17	1	1	1	1	1	1	1	1	1	0.9999
18	1	1	1	1	1	1	1	1	1	1

$\mathbb{P}(X \leq x)$ où $X \sim \mathcal{P}(\lambda)$

	λ									
x	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0
0	0.0022	0.0020	0.0018	0.0017	0.0015	0.0014	0.0012	0.0011	0.0010	0.0009
1	0.0159	0.0146	0.0134	0.0123	0.0113	0.0103	0.0095	0.0087	0.0080	0.0073
2	0.0577	0.0536	0.0498	0.0463	0.0430	0.0400	0.0371	0.0344	0.0320	0.0296
3	0.1425	0.1342	0.1264	0.1189	0.1118	0.1052	0.0988	0.0928	0.0871	0.0818
4	0.2719	0.2592	0.2469	0.2351	0.2237	0.2127	0.2022	0.1920	0.1823	0.1730
5	0.4298	0.4141	0.3988	0.3837	0.3690	0.3547	0.3406	0.3270	0.3137	0.3007
6	0.5902	0.5742	0.5582	0.5423	0.5265	0.5108	0.4953	0.4799	0.4647	0.4497
7	0.7301	0.7160	0.7017	0.6873	0.6728	0.6581	0.6433	0.6285	0.6136	0.5987
8	0.8367	0.8259	0.8148	0.8033	0.7916	0.7796	0.7673	0.7548	0.7420	0.7291
9	0.9090	0.9016	0.8939	0.8858	0.8774	0.8686	0.8596	0.8502	0.8405	0.8305
10	0.9531	0.9486	0.9437	0.9386	0.9332	0.9274	0.9214	0.9151	0.9084	0.9015
11	0.9776	0.9750	0.9723	0.9693	0.9661	0.9627	0.9591	0.9552	0.9510	0.9467
12	0.9900	0.9887	0.9873	0.9857	0.9840	0.9821	0.9801	0.9779	0.9755	0.9730
13	0.9958	0.9952	0.9945	0.9937	0.9929	0.9920	0.9909	0.9898	0.9885	0.9872
14	0.9984	0.9981	0.9978	0.9974	0.9970	0.9966	0.9961	0.9956	0.9950	0.9943
15	0.9994	0.9993	0.9992	0.9990	0.9988	0.9986	0.9984	0.9982	0.9979	0.9976
16	0.9998	0.9997	0.9997	0.9996	0.9996	0.9995	0.9994	0.9993	0.9992	0.9990
17	0.9999	0.9999	0.9999	0.9999	0.9998	0.9998	0.9998	0.9997	0.9997	0.9996
18	1	1	1	1	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
19	1	1	1	1	1	1	1	1	1	1

$\mathbb{P}(X \leq x)$ où $X \sim \mathcal{P}(\lambda)$										
	λ									
x	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8.0
0	0.0008	0.0007	0.0007	0.0006	0.0006	0.0005	0.0005	0.0004	0.0004	0.0003
1	0.0067	0.0061	0.0056	0.0051	0.0047	0.0043	0.0039	0.0036	0.0033	0.0030
2	0.0275	0.0255	0.0236	0.0219	0.0203	0.0188	0.0174	0.0161	0.0149	0.0138
3	0.0767	0.0719	0.0674	0.0632	0.0591	0.0554	0.0518	0.0485	0.0453	0.0424
4	0.1641	0.1555	0.1473	0.1395	0.1321	0.1249	0.1181	0.1117	0.1055	0.0996
5	0.2881	0.2759	0.2640	0.2526	0.2414	0.2307	0.2203	0.2103	0.2006	0.1912
6	0.4349	0.4204	0.4060	0.3920	0.3782	0.3646	0.3514	0.3384	0.3257	0.3134
7	0.5838	0.5689	0.5541	0.5393	0.5246	0.5100	0.4956	0.4812	0.4670	0.4530
8	0.7160	0.7027	0.6892	0.6757	0.6620	0.6482	0.6343	0.6204	0.6065	0.5925
9	0.8202	0.8096	0.7988	0.7877	0.7764	0.7649	0.7531	0.7411	0.7290	0.7166
10	0.8942	0.8867	0.8788	0.8707	0.8622	0.8535	0.8445	0.8352	0.8257	0.8159
11	0.9420	0.9371	0.9319	0.9265	0.9208	0.9148	0.9085	0.9020	0.8952	0.8881
12	0.9703	0.9673	0.9642	0.9609	0.9573	0.9536	0.9496	0.9454	0.9409	0.9362
13	0.9857	0.9841	0.9824	0.9805	0.9784	0.9762	0.9739	0.9714	0.9687	0.9658
14	0.9935	0.9927	0.9918	0.9908	0.9897	0.9886	0.9873	0.9859	0.9844	0.9827
15	0.9972	0.9969	0.9964	0.9959	0.9954	0.9948	0.9941	0.9934	0.9926	0.9918
16	0.9989	0.9987	0.9985	0.9983	0.9980	0.9978	0.9974	0.9971	0.9967	0.9963
17	0.9996	0.9995	0.9994	0.9993	0.9992	0.9991	0.9989	0.9988	0.9986	0.9984
18	0.9998	0.9998	0.9998	0.9997	0.9997	0.9996	0.9996	0.9995	0.9994	0.9993
19	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9998	0.9998	0.9998	0.9997
20	1	1	1	1	1	1	0.9999	0.9999	0.9999	0.9999
21	1	1	1	1	1	1	1	1	1	1

$\mathbb{P}(X \leq x)$ où $X \sim \mathcal{P}(\lambda)$										
	λ									
x	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	9.0
0	0.0003	0.0003	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001
1	0.0028	0.0025	0.0023	0.0021	0.0019	0.0018	0.0016	0.0015	0.0014	0.0012
2	0.0127	0.0118	0.0109	0.0100	0.0093	0.0086	0.0079	0.0073	0.0068	0.0062
3	0.0396	0.0370	0.0346	0.0323	0.0301	0.0281	0.0262	0.0244	0.0228	0.0212
4	0.0940	0.0887	0.0837	0.0789	0.0744	0.0701	0.0660	0.0621	0.0584	0.0550
5	0.1822	0.1736	0.1653	0.1573	0.1496	0.1422	0.1352	0.1284	0.1219	0.1157
6	0.3013	0.2896	0.2781	0.2670	0.2562	0.2457	0.2355	0.2256	0.2160	0.2068
7	0.4391	0.4254	0.4119	0.3987	0.3856	0.3728	0.3602	0.3478	0.3357	0.3239
8	0.5786	0.5647	0.5507	0.5369	0.5231	0.5094	0.4958	0.4823	0.4689	0.4557
9	0.7041	0.6915	0.6788	0.6659	0.6530	0.6400	0.6269	0.6137	0.6006	0.5874
10	0.8058	0.7955	0.7850	0.7743	0.7634	0.7522	0.7409	0.7294	0.7178	0.7060
11	0.8807	0.8731	0.8652	0.8571	0.8487	0.8400	0.8311	0.8220	0.8126	0.8030
12	0.9313	0.9261	0.9207	0.9150	0.9091	0.9029	0.8965	0.8898	0.8829	0.8758
13	0.9628	0.9595	0.9561	0.9524	0.9486	0.9445	0.9403	0.9358	0.9311	0.9261
14	0.9810	0.9791	0.9771	0.9749	0.9726	0.9701	0.9675	0.9647	0.9617	0.9585
15	0.9908	0.9898	0.9887	0.9875	0.9862	0.9848	0.9832	0.9816	0.9798	0.9780
16	0.9958	0.9953	0.9947	0.9941	0.9934	0.9926	0.9918	0.9909	0.9899	0.9889
17	0.9982	0.9979	0.9977	0.9973	0.9970	0.9966	0.9962	0.9957	0.9952	0.9947
18	0.9992	0.9991	0.9990	0.9989	0.9987	0.9985	0.9983	0.9981	0.9978	0.9976
19	0.9997	0.9997	0.9996	0.9995	0.9995	0.9994	0.9993	0.9992	0.9991	0.9989
20	0.9999	0.9999	0.9998	0.9998	0.9998	0.9998	0.9997	0.9997	0.9996	0.9996
21	1	1	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9998	0.9998
22	1	1	1	1	1	1	1	1	0.9999	0.9999
23	1	1	1	1	1	1	1	1	1	1

$\mathbb{P}(X \leq x)$ où $X \sim \mathcal{P}(\lambda)$

	λ									
x	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	10.0
0	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0000
1	0.0011	0.0010	0.0009	0.0009	0.0008	0.0007	0.0007	0.0006	0.0005	0.0005
2	0.0058	0.0053	0.0049	0.0045	0.0042	0.0038	0.0035	0.0033	0.0030	0.0028
3	0.0198	0.0184	0.0172	0.0160	0.0149	0.0138	0.0129	0.0120	0.0111	0.0103
4	0.0517	0.0486	0.0456	0.0429	0.0403	0.0378	0.0355	0.0333	0.0312	0.0293
5	0.1098	0.1041	0.0986	0.0935	0.0885	0.0838	0.0793	0.0750	0.0710	0.0671
6	0.1978	0.1892	0.1808	0.1727	0.1649	0.1574	0.1502	0.1433	0.1366	0.1301
7	0.3123	0.3010	0.2900	0.2792	0.2687	0.2584	0.2485	0.2388	0.2294	0.2202
8	0.4426	0.4296	0.4168	0.4042	0.3918	0.3796	0.3676	0.3558	0.3442	0.3328
9	0.5742	0.5611	0.5479	0.5349	0.5218	0.5089	0.4960	0.4832	0.4705	0.4579
10	0.6941	0.6820	0.6699	0.6576	0.6453	0.6329	0.6205	0.6080	0.5955	0.5830
11	0.7932	0.7832	0.7730	0.7626	0.7520	0.7412	0.7303	0.7193	0.7081	0.6968
12	0.8684	0.8607	0.8529	0.8448	0.8364	0.8279	0.8191	0.8101	0.8009	0.7916
13	0.9210	0.9156	0.9100	0.9042	0.8981	0.8919	0.8853	0.8786	0.8716	0.8645
14	0.9552	0.9517	0.9480	0.9441	0.9400	0.9357	0.9312	0.9265	0.9216	0.9165
15	0.9760	0.9738	0.9715	0.9691	0.9665	0.9638	0.9609	0.9579	0.9546	0.9513
16	0.9878	0.9865	0.9852	0.9838	0.9823	0.9806	0.9789	0.9770	0.9751	0.9730
17	0.9941	0.9934	0.9927	0.9919	0.9911	0.9902	0.9892	0.9881	0.9870	0.9857
18	0.9973	0.9969	0.9966	0.9962	0.9957	0.9952	0.9947	0.9941	0.9935	0.9928
19	0.9988	0.9986	0.9985	0.9983	0.9980	0.9978	0.9975	0.9972	0.9969	0.9965
20	0.9995	0.9994	0.9993	0.9992	0.9991	0.9990	0.9989	0.9987	0.9986	0.9984
21	0.9998	0.9998	0.9997	0.9997	0.9996	0.9996	0.9995	0.9995	0.9994	0.9993
22	0.9999	0.9999	0.9999	0.9999	0.9999	0.9998	0.9998	0.9998	0.9997	0.9997
23	1	1	1	1	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
24	1	1	1	1	1	1	1	1	1	1

$\mathbb{P}(X \leq x)$ où $X \sim \mathcal{P}(\lambda)$

	λ									
x	11.0	12.0	13.0	14.0	15.0	16.0	17.0	18.0	19.0	20.0
0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	0.0002	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2	0.0012	0.0005	0.0002	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	0.0049	0.0023	0.0011	0.0005	0.0002	0.0001	0.0000	0.0000	0.0000	0.0000
4	0.0151	0.0076	0.0037	0.0018	0.0009	0.0004	0.0002	0.0001	0.0000	0.0000
5	0.0375	0.0203	0.0107	0.0055	0.0028	0.0014	0.0007	0.0003	0.0002	0.0001
6	0.0786	0.0458	0.0259	0.0142	0.0076	0.0040	0.0021	0.0010	0.0005	0.0003
7	0.1432	0.0895	0.0540	0.0316	0.0180	0.0100	0.0054	0.0029	0.0015	0.0008
8	0.2320	0.1550	0.0998	0.0621	0.0374	0.0220	0.0126	0.0071	0.0039	0.0021
9	0.3405	0.2424	0.1658	0.1094	0.0699	0.0433	0.0261	0.0154	0.0089	0.0050
10	0.4599	0.3472	0.2517	0.1757	0.1185	0.0774	0.0491	0.0304	0.0183	0.0108
11	0.5793	0.4616	0.3532	0.2600	0.1848	0.1270	0.0847	0.0549	0.0347	0.0214
12	0.6887	0.5760	0.4631	0.3585	0.2676	0.1931	0.1350	0.0917	0.0606	0.0390
13	0.7813	0.6815	0.5730	0.4644	0.3632	0.2745	0.2009	0.1426	0.0984	0.0661
14	0.8540	0.7720	0.6751	0.5704	0.4657	0.3675	0.2808	0.2081	0.1497	0.1049
15	0.9074	0.8444	0.7636	0.6694	0.5681	0.4667	0.3715	0.2867	0.2148	0.1565
16	0.9441	0.8987	0.8355	0.7559	0.6641	0.5660	0.4677	0.3751	0.2920	0.2211
17	0.9678	0.9370	0.8905	0.8272	0.7489	0.6593	0.5640	0.4686	0.3784	0.2970
18	0.9823	0.9626	0.9302	0.8826	0.8195	0.7423	0.6550	0.5622	0.4695	0.3814
19	0.9907	0.9787	0.9573	0.9235	0.8752	0.8122	0.7363	0.6509	0.5606	0.4703
20	0.9953	0.9884	0.9750	0.9521	0.9170	0.8682	0.8055	0.7307	0.6472	0.5591
21	0.9977	0.9939	0.9859	0.9712	0.9469	0.9108	0.8615	0.7991	0.7255	0.6437
22	0.9990	0.9970	0.9924	0.9833	0.9673	0.9418	0.9047	0.8551	0.7931	0.7206
23	0.9995	0.9985	0.9960	0.9907	0.9805	0.9633	0.9367	0.8989	0.8490	0.7875
24	0.9998	0.9993	0.9980	0.9950	0.9888	0.9777	0.9594	0.9317	0.8933	0.8432
25	0.9999	0.9997	0.9990	0.9974	0.9938	0.9869	0.9748	0.9554	0.9269	0.8878
26	1	0.9999	0.9995	0.9987	0.9967	0.9925	0.9848	0.9718	0.9514	0.9221
27	1	0.9999	0.9998	0.9994	0.9983	0.9959	0.9912	0.9827	0.9687	0.9475
28	1	1	0.9999	0.9997	0.9991	0.9978	0.9950	0.9897	0.9805	0.9657
29	1	1	1	0.9999	0.9996	0.9989	0.9973	0.9941	0.9882	0.9782

1.3 Fonction de répartition de la loi Normale centrée réduite

- Si $X \sim \mathcal{N}(\mu, \sigma^2)$, alors $f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left(-\frac{1}{2}(\frac{x-\mu}{\sigma})^2\right)$, $\mathbb{E}(X) = \mu$ et $\mathrm{Var}(X) = \sigma^2$.
- On note quelquefois U la v. a. gaussienne centrée-réduite et Φ sa fonction de répartition : $U \sim \mathcal{N}(0, 1)$.
- La table qui suit donne les valeurs de la fonction de répartition empirique de la loi normale centrée réduite $\Phi(x)$ pour les valeurs de x positives.
- Pour les valeurs négatives de x, on utilisera la relation $\Phi(x) = 1 - \Phi(-x)$.

$\Phi(x) = \mathbb{P}(X \leq x)$ où $X \sim \mathcal{N}(0, 1)$ et $x = x_1 + x_2$

	x_2									
x_1	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.00	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.10	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.20	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.30	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.40	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.50	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.60	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.70	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.80	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.90	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.00	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.10	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.20	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.30	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.40	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.50	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.60	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.70	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.80	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.90	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.00	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.10	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.20	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.30	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.40	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.50	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.60	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.70	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.80	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.90	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.00	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.10	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.20	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.30	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.40	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998
3.50	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998
3.60	0.9998	0.9998	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.70	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.80	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
3.90	1	1	1	1	1	1	1	1	1	1

1.4 Fractiles de la loi Normale centrée réduite

Pour les valeurs de $\alpha < 0.5$, on utilisera la relation $u_\alpha = -u_{1-\alpha}$

$u_\alpha = \Phi^{-1}(\alpha)$ où $\alpha = \alpha_1 + \alpha_2$

	α_2									
α_1	0.000	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
0.500	0.0000	0.0025	0.0050	0.0075	0.0100	0.0125	0.0150	0.0175	0.0201	0.0226
0.510	0.0251	0.0276	0.0301	0.0326	0.0351	0.0376	0.0401	0.0426	0.0451	0.0476
0.520	0.0502	0.0527	0.0552	0.0577	0.0602	0.0627	0.0652	0.0677	0.0702	0.0728
0.530	0.0753	0.0778	0.0803	0.0828	0.0853	0.0878	0.0904	0.0929	0.0954	0.0979
0.540	0.1004	0.1030	0.1055	0.1080	0.1105	0.1130	0.1156	0.1181	0.1206	0.1231
0.550	0.1257	0.1282	0.1307	0.1332	0.1358	0.1383	0.1408	0.1434	0.1459	0.1484
0.560	0.1510	0.1535	0.1560	0.1586	0.1611	0.1637	0.1662	0.1687	0.1713	0.1738
0.570	0.1764	0.1789	0.1815	0.1840	0.1866	0.1891	0.1917	0.1942	0.1968	0.1993
0.580	0.2019	0.2045	0.2070	0.2096	0.2121	0.2147	0.2173	0.2198	0.2224	0.2250
0.590	0.2275	0.2301	0.2327	0.2353	0.2378	0.2404	0.2430	0.2456	0.2482	0.2508
0.600	0.2533	0.2559	0.2585	0.2611	0.2637	0.2663	0.2689	0.2715	0.2741	0.2767
0.610	0.2793	0.2819	0.2845	0.2871	0.2898	0.2924	0.2950	0.2976	0.3002	0.3029
0.620	0.3055	0.3081	0.3107	0.3134	0.3160	0.3186	0.3213	0.3239	0.3266	0.3292
0.630	0.3319	0.3345	0.3372	0.3398	0.3425	0.3451	0.3478	0.3505	0.3531	0.3558
0.640	0.3585	0.3611	0.3638	0.3665	0.3692	0.3719	0.3745	0.3772	0.3799	0.3826
0.650	0.3853	0.3880	0.3907	0.3934	0.3961	0.3989	0.4016	0.4043	0.4070	0.4097
0.660	0.4125	0.4152	0.4179	0.4207	0.4234	0.4261	0.4289	0.4316	0.4344	0.4372
0.670	0.4399	0.4427	0.4454	0.4482	0.4510	0.4538	0.4565	0.4593	0.4621	0.4649
0.680	0.4677	0.4705	0.4733	0.4761	0.4789	0.4817	0.4845	0.4874	0.4902	0.4930
0.690	0.4959	0.4987	0.5015	0.5044	0.5072	0.5101	0.5129	0.5158	0.5187	0.5215
0.700	0.5244	0.5273	0.5302	0.5330	0.5359	0.5388	0.5417	0.5446	0.5476	0.5505
0.710	0.5534	0.5563	0.5592	0.5622	0.5651	0.5681	0.5710	0.5740	0.5769	0.5799
0.720	0.5828	0.5858	0.5888	0.5918	0.5948	0.5978	0.6008	0.6038	0.6068	0.6098
0.730	0.6128	0.6158	0.6189	0.6219	0.6250	0.6280	0.6311	0.6341	0.6372	0.6403
0.740	0.6433	0.6464	0.6495	0.6526	0.6557	0.6588	0.6620	0.6651	0.6682	0.6713
0.750	0.6745	0.6776	0.6808	0.6840	0.6871	0.6903	0.6935	0.6967	0.6999	0.7031
0.760	0.7063	0.7095	0.7128	0.7160	0.7192	0.7225	0.7257	0.7290	0.7323	0.7356
0.770	0.7388	0.7421	0.7454	0.7488	0.7521	0.7554	0.7588	0.7621	0.7655	0.7688
0.780	0.7722	0.7756	0.7790	0.7824	0.7858	0.7892	0.7926	0.7961	0.7995	0.8030
0.790	0.8064	0.8099	0.8134	0.8169	0.8204	0.8239	0.8274	0.8310	0.8345	0.8381
0.800	0.8416	0.8452	0.8488	0.8524	0.8560	0.8596	0.8633	0.8669	0.8705	0.8742
0.810	0.8779	0.8816	0.8853	0.8890	0.8927	0.8965	0.9002	0.9040	0.9078	0.9116
0.820	0.9154	0.9192	0.9230	0.9269	0.9307	0.9346	0.9385	0.9424	0.9463	0.9502
0.830	0.9542	0.9581	0.9621	0.9661	0.9701	0.9741	0.9782	0.9822	0.9863	0.9904
0.840	0.9945	0.9986	1.0027	1.0069	1.0110	1.0152	1.0194	1.0237	1.0279	1.0322
0.850	1.0364	1.0407	1.0450	1.0494	1.0537	1.0581	1.0625	1.0669	1.0714	1.0758
0.860	1.0803	1.0848	1.0893	1.0939	1.0985	1.1031	1.1077	1.1123	1.1170	1.1217
0.870	1.1264	1.1311	1.1359	1.1407	1.1455	1.1503	1.1552	1.1601	1.1650	1.1700
0.880	1.1750	1.1800	1.1850	1.1901	1.1952	1.2004	1.2055	1.2107	1.2160	1.2212
0.890	1.2265	1.2319	1.2372	1.2426	1.2481	1.2536	1.2591	1.2646	1.2702	1.2759
0.900	1.2816	1.2873	1.2930	1.2988	1.3047	1.3106	1.3165	1.3225	1.3285	1.3346
0.910	1.3408	1.3469	1.3532	1.3595	1.3658	1.3722	1.3787	1.3852	1.3917	1.3984
0.920	1.4051	1.4118	1.4187	1.4255	1.4325	1.4395	1.4466	1.4538	1.4611	1.4684
0.930	1.4758	1.4833	1.4909	1.4985	1.5063	1.5141	1.5220	1.5301	1.5382	1.5464
0.940	1.5548	1.5632	1.5718	1.5805	1.5893	1.5982	1.6072	1.6164	1.6258	1.6352
0.950	1.6449	1.6546	1.6646	1.6747	1.6849	1.6954	1.7060	1.7169	1.7279	1.7392
0.960	1.7507	1.7624	1.7744	1.7866	1.7991	1.8119	1.8250	1.8384	1.8522	1.8663
0.970	1.8808	1.8957	1.9110	1.9268	1.9431	1.9600	1.9774	1.9954	2.0141	2.0335
0.980	2.0537	2.0749	2.0969	2.1201	2.1444	2.1701	2.1973	2.2262	2.2571	2.2904
0.990	2.3263	2.3656	2.4089	2.4573	2.5121	2.5758	2.6521	2.7478	2.8782	3.0902

1.5 Fractiles de la loi du χ^2

Si $X \sim \chi^2_\nu$, $\mathbb{E}(X) = \nu$ et $\mathrm{Var}(X) = 2\nu$. Pour les valeurs de $\nu > 50$, on utilisera la relation $\chi^2_{\nu,\alpha} = (u_\alpha + \sqrt{2\nu - 1})^2/2$.

$\chi^2_{\nu,\alpha}$													
	α												
ν	0.005	0.010	0.025	0.050	0.100	0.250	0.500	0.750	0.900	0.950	0.975	0.990	0.995
1	0.0000393	0.000157	0.000982	0.00393	0.0158	0.102	0.455	1.32	2.71	3.84	5.02	6.63	7.88
2	0.0100	0.0201	0.0506	0.103	0.211	0.575	1.39	2.77	4.61	5.99	7.38	9.21	10.6
3	0.0717	0.115	0.216	0.352	0.584	1.21	2.37	4.11	6.25	7.81	9.35	11.3	12.8
4	0.207	0.297	0.484	0.711	1.06	1.92	3.36	5.39	7.78	9.49	11.1	13.3	14.9
5	0.412	0.554	0.831	1.15	1.61	2.67	4.35	6.63	9.24	11.1	12.8	15.1	16.7
6	0.676	0.872	1.24	1.64	2.20	3.45	5.35	7.84	10.6	12.6	14.4	16.8	18.5
7	0.989	1.24	1.69	2.17	2.83	4.25	6.35	9.04	12.0	14.1	16.0	18.5	20.3
8	1.34	1.65	2.18	2.73	3.49	5.07	7.34	10.2	13.4	15.5	17.5	20.1	22.0
9	1.73	2.09	2.70	3.33	4.17	5.90	8.34	11.4	14.7	16.9	19.0	21.7	23.6
10	2.16	2.56	3.25	3.94	4.87	6.74	9.34	12.5	16.0	18.3	20.5	23.2	25.2
11	2.60	3.05	3.82	4.57	5.58	7.58	10.3	13.7	17.3	19.7	21.9	24.7	26.8
12	3.07	3.57	4.40	5.23	6.30	8.44	11.3	14.8	18.5	21.0	23.3	26.2	28.3
13	3.57	4.11	5.01	5.89	7.04	9.30	12.3	16.0	19.8	22.4	24.7	27.7	29.8
14	4.07	4.66	5.63	6.57	7.79	10.2	13.3	17.1	21.1	23.7	26.1	29.1	31.3
15	4.60	5.23	6.26	7.26	8.55	11.0	14.3	18.2	22.3	25.0	27.5	30.6	32.8
16	5.14	5.81	6.91	7.96	9.31	11.9	15.3	19.4	23.5	26.3	28.8	32.0	34.3
17	5.70	6.41	7.56	8.67	10.1	12.8	16.3	20.5	24.8	27.6	30.2	33.4	35.7
18	6.26	7.01	8.23	9.39	10.9	13.7	17.3	21.6	26.0	28.9	31.5	34.8	37.2
19	6.84	7.63	8.91	10.1	11.7	14.6	18.3	22.7	27.2	30.1	32.9	36.2	38.6
20	7.43	8.26	9.59	10.9	12.4	15.5	19.3	23.8	28.4	31.4	34.2	37.6	40.0
21	8.03	8.90	10.3	11.6	13.2	16.3	20.3	24.9	29.6	32.7	35.5	38.9	41.4
22	8.64	9.54	11.0	12.3	14.0	17.2	21.3	26.0	30.8	33.9	36.8	40.3	42.8
23	9.26	10.2	11.7	13.1	14.8	18.1	22.3	27.1	32.0	35.2	38.1	41.6	44.2
24	9.89	10.9	12.4	13.8	15.7	19.0	23.3	28.2	33.2	36.4	39.4	43.0	45.6
25	10.5	11.5	13.1	14.6	16.5	19.9	24.3	29.3	34.4	37.7	40.6	44.3	46.9
26	11.2	12.2	13.8	15.4	17.3	20.8	25.3	30.4	35.6	38.9	41.9	45.6	48.3
27	11.8	12.9	14.6	16.2	18.1	21.7	26.3	31.5	36.7	40.1	43.2	47.0	49.6
28	12.5	13.6	15.3	16.9	18.9	22.7	27.3	32.6	37.9	41.3	44.5	48.3	51.0
29	13.1	14.3	16.0	17.7	19.8	23.6	28.3	33.7	39.1	42.6	45.7	49.6	52.3
30	13.8	15.0	16.8	18.5	20.6	24.5	29.3	34.8	40.3	43.8	47.0	50.9	53.7
31	14.5	15.7	17.5	19.3	21.4	25.4	30.3	35.9	41.4	45.0	48.2	52.2	55.0
32	15.1	16.4	18.3	20.1	22.3	26.3	31.3	37.0	42.6	46.2	49.5	53.5	56.3
33	15.8	17.1	19.0	20.9	23.1	27.2	32.3	38.1	43.7	47.4	50.7	54.8	57.6
34	16.5	17.8	19.8	21.7	24.0	28.1	33.3	39.1	44.9	48.6	52.0	56.1	59.0
35	17.2	18.5	20.6	22.5	24.8	29.1	34.3	40.2	46.1	49.8	53.2	57.3	60.3
36	17.9	19.2	21.3	23.3	25.6	30.0	35.3	41.3	47.2	51.0	54.4	58.6	61.6
37	18.6	20.0	22.1	24.1	26.5	30.9	36.3	42.4	48.4	52.2	55.7	59.9	62.9
38	19.3	20.7	22.9	24.9	27.3	31.8	37.3	43.5	49.5	53.4	56.9	61.2	64.2
39	20.0	21.4	23.7	25.7	28.2	32.7	38.3	44.5	50.7	54.6	58.1	62.4	65.5
40	20.7	22.2	24.4	26.5	29.1	33.7	39.3	45.6	51.8	55.8	59.3	63.7	66.8
41	21.4	22.9	25.2	27.3	29.9	34.6	40.3	46.7	52.9	56.9	60.6	65.0	68.1
42	22.1	23.7	26.0	28.1	30.8	35.5	41.3	47.8	54.1	58.1	61.8	66.2	69.3
43	22.9	24.4	26.8	29.0	31.6	36.4	42.3	48.8	55.2	59.3	63.0	67.5	70.6
44	23.6	25.1	27.6	29.8	32.5	37.4	43.3	49.9	56.4	60.5	64.2	68.7	71.9
45	24.3	25.9	28.4	30.6	33.4	38.3	44.3	51.0	57.5	61.7	65.4	70.0	73.2
46	25.0	26.7	29.2	31.4	34.2	39.2	45.3	52.1	58.6	62.8	66.6	71.2	74.4
47	25.8	27.4	30.0	32.3	35.1	40.1	46.3	53.1	59.8	64.0	67.8	72.4	75.7
48	26.5	28.2	30.8	33.1	35.9	41.1	47.3	54.2	60.9	65.2	69.0	73.7	77.0
49	27.2	28.9	31.6	33.9	36.8	42.0	48.3	55.3	62.0	66.3	70.2	74.9	78.2
50	28.0	29.7	32.4	34.8	37.7	42.9	49.3	56.3	63.2	67.5	71.4	76.2	79.5

1.6 Fractiles de la loi de Student

Pour les valeurs de $\alpha \leq 0.5$, on utilisera la relation $t_{\nu,\alpha} = -t_{\nu,1-\alpha}$.

$t_{\nu,\alpha}$								
	α							
ν	0.6	0.75	0.9	0.95	0.975	0.99	0.995	0.9995
1	0.325	1.000	3.078	6.314	12.706	31.821	63.657	636.619
2	0.289	0.816	1.886	2.920	4.303	6.965	9.925	31.599
3	0.277	0.765	1.638	2.353	3.182	4.541	5.841	12.924
4	0.271	0.741	1.533	2.132	2.776	3.747	4.604	8.610
5	0.267	0.727	1.476	2.015	2.571	3.365	4.032	6.869
6	0.265	0.718	1.440	1.943	2.447	3.143	3.707	5.959
7	0.263	0.711	1.415	1.895	2.365	2.998	3.499	5.408
8	0.262	0.706	1.397	1.860	2.306	2.896	3.355	5.041
9	0.261	0.703	1.383	1.833	2.262	2.821	3.250	4.781
10	0.260	0.700	1.372	1.812	2.228	2.764	3.169	4.587
11	0.260	0.697	1.363	1.796	2.201	2.718	3.106	4.437
12	0.259	0.695	1.356	1.782	2.179	2.681	3.055	4.318
13	0.259	0.694	1.350	1.771	2.160	2.650	3.012	4.221
14	0.258	0.692	1.345	1.761	2.145	2.624	2.977	4.140
15	0.258	0.691	1.341	1.753	2.131	2.602	2.947	4.073
16	0.258	0.690	1.337	1.746	2.120	2.583	2.921	4.015
17	0.257	0.689	1.333	1.740	2.110	2.567	2.898	3.965
18	0.257	0.688	1.330	1.734	2.101	2.552	2.878	3.922
19	0.257	0.688	1.328	1.729	2.093	2.539	2.861	3.883
20	0.257	0.687	1.325	1.725	2.086	2.528	2.845	3.850
21	0.257	0.686	1.323	1.721	2.080	2.518	2.831	3.819
22	0.256	0.686	1.321	1.717	2.074	2.508	2.819	3.792
23	0.256	0.685	1.319	1.714	2.069	2.500	2.807	3.768
24	0.256	0.685	1.318	1.711	2.064	2.492	2.797	3.745
25	0.256	0.684	1.316	1.708	2.060	2.485	2.787	3.725
26	0.256	0.684	1.315	1.706	2.056	2.479	2.779	3.707
27	0.256	0.684	1.314	1.703	2.052	2.473	2.771	3.690
28	0.256	0.683	1.313	1.701	2.048	2.467	2.763	3.674
29	0.256	0.683	1.311	1.699	2.045	2.462	2.756	3.659
30	0.256	0.683	1.310	1.697	2.042	2.457	2.750	3.646
40	0.255	0.681	1.303	1.684	2.021	2.423	2.704	3.551
60	0.254	0.679	1.296	1.671	2.000	2.390	2.660	3.460
120	0.254	0.677	1.289	1.658	1.980	2.358	2.617	3.373
1000	0.253	0.675	1.282	1.646	1.962	2.330	2.581	3.300

1.7 Fractiles de la loi de Fisher

Pour les petites valeurs de $\alpha \leq 0.5$, on utilisera la relation : $F_{\nu_1,\nu_2,\alpha} = 1/F_{\nu_2,\nu_1,1-\alpha}$.

$F_{\nu_1,\nu_2,0.90}$																			
	ν_1																		
ν_2	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	∞
1	39.86	49.50	53.59	55.83	57.24	58.20	58.91	59.44	59.86	60.19	60.71	61.22	61.74	62.00	62.26	62.53	62.79	63.06	66.12
2	8.53	9.00	9.16	9.24	9.29	9.33	9.35	9.37	9.38	9.39	9.41	9.42	9.44	9.45	9.46	9.47	9.47	9.48	9.49
3	5.54	5.46	5.39	5.34	5.31	5.28	5.27	5.25	5.24	5.23	5.22	5.20	5.18	5.18	5.17	5.16	5.15	5.14	5.13
4	4.54	4.32	4.19	4.11	4.05	4.01	3.98	3.95	3.94	3.92	3.90	3.87	3.84	3.83	3.82	3.80	3.79	3.78	3.76
5	4.06	3.78	3.62	3.52	3.45	3.40	3.37	3.34	3.32	3.30	3.27	3.24	3.21	3.19	3.17	3.16	3.14	3.12	3.10
6	3.78	3.46	3.29	3.18	3.11	3.05	3.01	2.98	2.96	2.94	2.90	2.87	2.84	2.82	2.80	2.78	2.76	2.74	2.72
7	3.59	3.26	3.07	2.96	2.88	2.83	2.78	2.75	2.72	2.70	2.67	2.63	2.59	2.58	2.56	2.54	2.51	2.49	2.47
8	3.46	3.11	2.92	2.81	2.73	2.67	2.62	2.59	2.56	2.54	2.50	2.46	2.42	2.40	2.38	2.36	2.34	2.32	2.29
9	3.36	3.01	2.81	2.69	2.61	2.55	2.51	2.47	2.44	2.42	2.38	2.34	2.30	2.28	2.25	2.23	2.21	2.18	2.16
10	3.29	2.92	2.73	2.61	2.52	2.46	2.41	2.38	2.35	2.32	2.28	2.24	2.20	2.18	2.16	2.13	2.11	2.08	2.06
11	3.23	2.86	2.66	2.54	2.45	2.39	2.34	2.30	2.27	2.25	2.21	2.17	2.12	2.10	2.08	2.05	2.03	2.00	1.97
12	3.18	2.81	2.61	2.48	2.39	2.33	2.28	2.24	2.21	2.19	2.15	2.10	2.06	2.04	2.01	1.99	1.96	1.93	1.90
13	3.14	2.76	2.56	2.43	2.35	2.28	2.23	2.20	2.16	2.14	2.10	2.05	2.01	1.98	1.96	1.93	1.90	1.88	1.85
14	3.10	2.73	2.52	2.39	2.31	2.24	2.19	2.15	2.12	2.10	2.05	2.01	1.96	1.94	1.91	1.89	1.86	1.83	1.80
15	3.07	2.70	2.49	2.36	2.27	2.21	2.16	2.12	2.09	2.06	2.02	1.97	1.92	1.90	1.87	1.85	1.82	1.79	1.76
16	3.05	2.67	2.46	2.33	2.24	2.18	2.13	2.09	2.06	2.03	1.99	1.94	1.89	1.87	1.84	1.81	1.78	1.75	1.72
17	3.03	2.64	2.44	2.31	2.22	2.15	2.10	2.06	2.03	2.00	1.96	1.91	1.86	1.84	1.81	1.78	1.75	1.72	1.69
18	3.01	2.62	2.42	2.29	2.20	2.13	2.08	2.04	2.00	1.98	1.93	1.89	1.84	1.81	1.78	1.75	1.72	1.69	1.66
19	2.99	2.61	2.40	2.27	2.18	2.11	2.06	2.02	1.98	1.96	1.91	1.86	1.81	1.79	1.76	1.73	1.70	1.67	1.63
20	2.97	2.59	2.38	2.25	2.16	2.09	2.04	2.00	1.96	1.94	1.89	1.84	1.79	1.77	1.74	1.71	1.68	1.64	1.61
21	2.96	2.57	2.36	2.23	2.14	2.08	2.02	1.98	1.95	1.92	1.87	1.83	1.78	1.75	1.72	1.69	1.66	1.62	1.59
22	2.95	2.56	2.35	2.22	2.13	2.06	2.01	1.97	1.93	1.90	1.86	1.81	1.76	1.73	1.70	1.67	1.64	1.60	1.57
23	2.94	2.55	2.34	2.21	2.11	2.05	1.99	1.95	1.92	1.89	1.84	1.80	1.74	1.72	1.69	1.66	1.62	1.59	1.55
24	2.93	2.54	2.33	2.19	2.10	2.04	1.98	1.94	1.91	1.88	1.83	1.78	1.73	1.70	1.67	1.64	1.61	1.57	1.53
25	2.92	2.53	2.32	2.18	2.09	2.02	1.97	1.93	1.89	1.87	1.82	1.77	1.72	1.69	1.66	1.63	1.59	1.56	1.52
26	2.91	2.52	2.31	2.17	2.08	2.01	1.96	1.92	1.88	1.86	1.81	1.76	1.71	1.68	1.65	1.61	1.58	1.54	1.50
27	2.90	2.51	2.30	2.17	2.07	2.00	1.95	1.91	1.87	1.85	1.80	1.75	1.70	1.67	1.64	1.60	1.57	1.53	1.49
28	2.89	2.50	2.29	2.16	2.06	2.00	1.94	1.90	1.87	1.84	1.79	1.74	1.69	1.66	1.63	1.59	1.56	1.52	1.48
29	2.89	2.50	2.28	2.15	2.06	1.99	1.93	1.89	1.86	1.83	1.78	1.73	1.68	1.65	1.62	1.58	1.55	1.51	1.47
30	2.88	2.49	2.28	2.14	2.05	1.98	1.93	1.88	1.85	1.82	1.77	1.72	1.67	1.64	1.61	1.57	1.54	1.50	1.46
40	2.84	2.44	2.23	2.09	2.00	1.93	1.87	1.83	1.79	1.76	1.71	1.66	1.61	1.57	1.54	1.51	1.47	1.42	1.38
60	2.79	2.39	2.18	2.04	1.95	1.87	1.82	1.77	1.74	1.71	1.66	1.60	1.54	1.51	1.48	1.44	1.40	1.35	1.29
120	2.75	2.35	2.13	1.99	1.90	1.82	1.77	1.72	1.68	1.65	1.60	1.55	1.48	1.45	1.41	1.37	1.32	1.26	1.19
∞	2.71	2.30	2.08	1.94	1.85	1.77	1.72	1.67	1.63	1.60	1.55	1.49	1.42	1.38	1.34	1.30	1.24	1.17	1.00

$F_{\nu_1,\nu_2,0.95}$

	ν_1																		
ν_2	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	∞
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5	241.9	243.9	245.9	248.0	249.1	250.1	251.1	252.2	253.3	395.4
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.41	19.43	19.45	19.45	19.46	19.47	19.48	19.49	19.50
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.70	8.66	8.64	8.62	8.59	8.57	8.55	8.53
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66	5.63
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.62	4.56	4.53	4.50	4.46	4.43	4.40	4.37
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.00	3.94	3.87	3.84	3.81	3.77	3.74	3.70	3.67
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.57	3.51	3.44	3.41	3.38	3.34	3.30	3.27	3.23
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.28	3.22	3.15	3.12	3.08	3.04	3.01	2.97	2.93
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.07	3.01	2.94	2.90	2.86	2.83	2.79	2.75	2.71
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.91	2.85	2.77	2.74	2.70	2.66	2.62	2.58	2.54
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.79	2.72	2.65	2.61	2.57	2.53	2.49	2.45	2.40
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.69	2.62	2.54	2.51	2.47	2.43	2.38	2.34	2.30
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.60	2.53	2.46	2.42	2.38	2.34	2.30	2.25	2.21
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.53	2.46	2.39	2.35	2.31	2.27	2.22	2.18	2.13
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.48	2.40	2.33	2.29	2.25	2.20	2.16	2.11	2.07
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49	2.42	2.35	2.28	2.24	2.19	2.15	2.11	2.06	2.01
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45	2.38	2.31	2.23	2.19	2.15	2.10	2.06	2.01	1.96
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41	2.34	2.27	2.19	2.15	2.11	2.06	2.02	1.97	1.92
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38	2.31	2.23	2.16	2.11	2.07	2.03	1.98	1.93	1.88
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35	2.28	2.20	2.12	2.08	2.04	1.99	1.95	1.90	1.84
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32	2.25	2.18	2.10	2.05	2.01	1.96	1.92	1.87	1.81
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30	2.23	2.15	2.07	2.03	1.98	1.94	1.89	1.84	1.78
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27	2.20	2.13	2.05	2.01	1.96	1.91	1.86	1.81	1.76
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25	2.18	2.11	2.03	1.98	1.94	1.89	1.84	1.79	1.73
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.24	2.16	2.09	2.01	1.96	1.92	1.87	1.82	1.77	1.71
26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27	2.22	2.15	2.07	1.99	1.95	1.90	1.85	1.80	1.75	1.69
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25	2.20	2.13	2.06	1.97	1.93	1.88	1.84	1.79	1.73	1.67
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24	2.19	2.12	2.04	1.96	1.91	1.87	1.82	1.77	1.71	1.65
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22	2.18	2.10	2.03	1.94	1.90	1.85	1.81	1.75	1.70	1.64
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.09	2.01	1.93	1.89	1.84	1.79	1.74	1.68	1.62
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08	2.00	1.92	1.84	1.79	1.74	1.69	1.64	1.58	1.51
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	1.99	1.92	1.84	1.75	1.70	1.65	1.59	1.53	1.47	1.39
120	3.92	3.07	2.68	2.45	2.29	2.18	2.09	2.02	1.96	1.91	1.83	1.75	1.66	1.61	1.55	1.50	1.43	1.35	1.25
∞	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	1.83	1.75	1.67	1.57	1.52	1.46	1.39	1.32	1.22	1.00

$F_{\nu_1,\nu_2,0.975}$

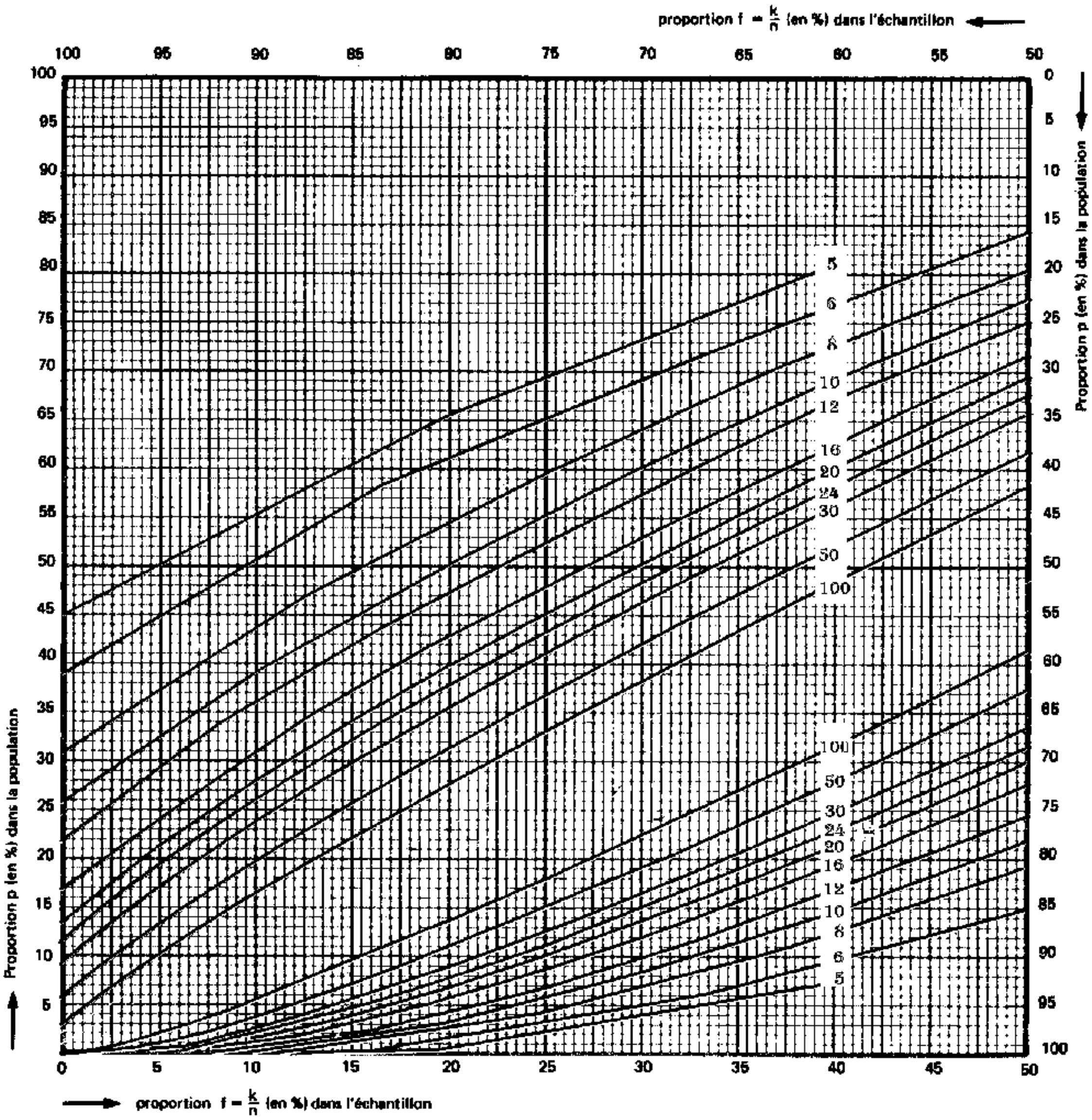
	ν_1																		
ν_2	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	∞
1	647.8	799.5	864.2	899.6	921.9	937.1	948.2	956.7	963.3	968.6	976.7	984.9	993.1	997.2	1001	1005	1009	1014	1018
2	38.51	39.00	39.17	39.25	39.30	39.33	39.36	39.37	39.39	39.40	39.41	39.43	39.45	39.46	39.46	39.47	39.48	39.49	39.50
3	17.44	16.04	15.44	15.10	14.88	14.73	14.62	14.54	14.47	14.42	14.34	14.25	14.17	14.12	14.08	14.04	13.99	13.95	13.90
4	12.22	10.65	9.98	9.60	9.36	9.20	9.07	8.98	8.90	8.84	8.75	8.66	8.56	8.51	8.46	8.41	8.36	8.31	8.26
5	10.01	8.43	7.76	7.39	7.15	6.98	6.85	6.76	6.68	6.62	6.52	6.43	6.33	6.28	6.23	6.18	6.12	6.07	6.02
6	8.81	7.26	6.60	6.23	5.99	5.82	5.70	5.60	5.52	5.46	5.37	5.27	5.17	5.12	5.07	5.01	4.96	4.90	4.85
7	8.07	6.54	5.89	5.52	5.29	5.12	4.99	4.90	4.82	4.76	4.67	4.57	4.47	4.41	4.36	4.31	4.25	4.20	4.14
8	7.57	6.06	5.42	5.05	4.82	4.65	4.53	4.43	4.36	4.30	4.20	4.10	4.00	3.95	3.89	3.84	3.78	3.73	3.67
9	7.21	5.71	5.08	4.72	4.48	4.32	4.20	4.10	4.03	3.96	3.87	3.77	3.67	3.61	3.56	3.51	3.45	3.39	3.33
10	6.94	5.46	4.83	4.47	4.24	4.07	3.95	3.85	3.78	3.72	3.62	3.52	3.42	3.37	3.31	3.26	3.20	3.14	3.08
11	6.72	5.26	4.63	4.28	4.04	3.88	3.76	3.66	3.59	3.53	3.43	3.33	3.23	3.17	3.12	3.06	3.00	2.94	2.88
12	6.55	5.10	4.47	4.12	3.89	3.73	3.61	3.51	3.44	3.37	3.28	3.18	3.07	3.02	2.96	2.91	2.85	2.79	2.72
13	6.41	4.97	4.35	4.00	3.77	3.60	3.48	3.39	3.31	3.25	3.15	3.05	2.95	2.89	2.84	2.78	2.72	2.66	2.60
14	6.30	4.86	4.24	3.89	3.66	3.50	3.38	3.29	3.21	3.15	3.05	2.95	2.84	2.79	2.73	2.67	2.61	2.55	2.49
15	6.20	4.77	4.15	3.80	3.58	3.41	3.29	3.20	3.12	3.06	2.96	2.86	2.76	2.70	2.64	2.59	2.52	2.46	2.40
16	6.12	4.69	4.08	3.73	3.50	3.34	3.22	3.12	3.05	2.99	2.89	2.79	2.68	2.63	2.57	2.51	2.45	2.38	2.32
17	6.04	4.62	4.01	3.66	3.44	3.28	3.16	3.06	2.98	2.92	2.82	2.72	2.62	2.56	2.50	2.44	2.38	2.32	2.25
18	5.98	4.56	3.95	3.61	3.38	3.22	3.10	3.01	2.93	2.87	2.77	2.67	2.56	2.50	2.44	2.38	2.32	2.26	2.19
19	5.92	4.51	3.90	3.56	3.33	3.17	3.05	2.96	2.88	2.82	2.72	2.62	2.51	2.45	2.39	2.33	2.27	2.20	2.13
20	5.87	4.46	3.86	3.51	3.29	3.13	3.01	2.91	2.84	2.77	2.68	2.57	2.46	2.41	2.35	2.29	2.22	2.16	2.09
21	5.83	4.42	3.82	3.48	3.25	3.09	2.97	2.87	2.80	2.73	2.64	2.53	2.42	2.37	2.31	2.25	2.18	2.11	2.04
22	5.79	4.38	3.78	3.44	3.22	3.05	2.93	2.84	2.76	2.70	2.60	2.50	2.39	2.33	2.27	2.21	2.14	2.08	2.00
23	5.75	4.35	3.75	3.41	3.18	3.02	2.90	2.81	2.73	2.67	2.57	2.47	2.36	2.30	2.24	2.18	2.11	2.04	1.97
24	5.72	4.32	3.72	3.38	3.15	2.99	2.87	2.78	2.70	2.64	2.54	2.44	2.33	2.27	2.21	2.15	2.08	2.01	1.94
25	5.69	4.29	3.69	3.35	3.13	2.97	2.85	2.75	2.68	2.61	2.51	2.41	2.30	2.24	2.18	2.12	2.05	1.98	1.91
26	5.66	4.27	3.67	3.33	3.10	2.94	2.82	2.73	2.65	2.59	2.49	2.39	2.28	2.22	2.16	2.09	2.03	1.95	1.88
27	5.63	4.24	3.65	3.31	3.08	2.92	2.80	2.71	2.63	2.57	2.47	2.36	2.25	2.19	2.13	2.07	2.00	1.93	1.85
28	5.61	4.22	3.63	3.29	3.06	2.90	2.78	2.69	2.61	2.55	2.45	2.34	2.23	2.17	2.11	2.05	1.98	1.91	1.83
29	5.59	4.20	3.61	3.27	3.04	2.88	2.76	2.67	2.59	2.53	2.43	2.32	2.21	2.15	2.09	2.03	1.96	1.89	1.81
30	5.57	4.18	3.59	3.25	3.03	2.87	2.75	2.65	2.57	2.51	2.41	2.31	2.20	2.14	2.07	2.01	1.94	1.87	1.79
40	5.42	4.05	3.46	3.13	2.90	2.74	2.62	2.53	2.45	2.39	2.29	2.18	2.07	2.01	1.94	1.88	1.80	1.72	1.64
60	5.29	3.93	3.34	3.01	2.79	2.63	2.51	2.41	2.33	2.27	2.17	2.06	1.94	1.88	1.82	1.74	1.67	1.58	1.48
120	5.15	3.80	3.23	2.89	2.67	2.52	2.39	2.30	2.22	2.16	2.05	1.94	1.82	1.76	1.69	1.61	1.53	1.43	1.31
∞	5.02	3.69	3.12	2.79	2.57	2.41	2.29	2.19	2.11	2.05	1.94	1.83	1.71	1.64	1.57	1.48	1.39	1.27	1.00

$F_{\nu_1,\nu_2,0.99}$

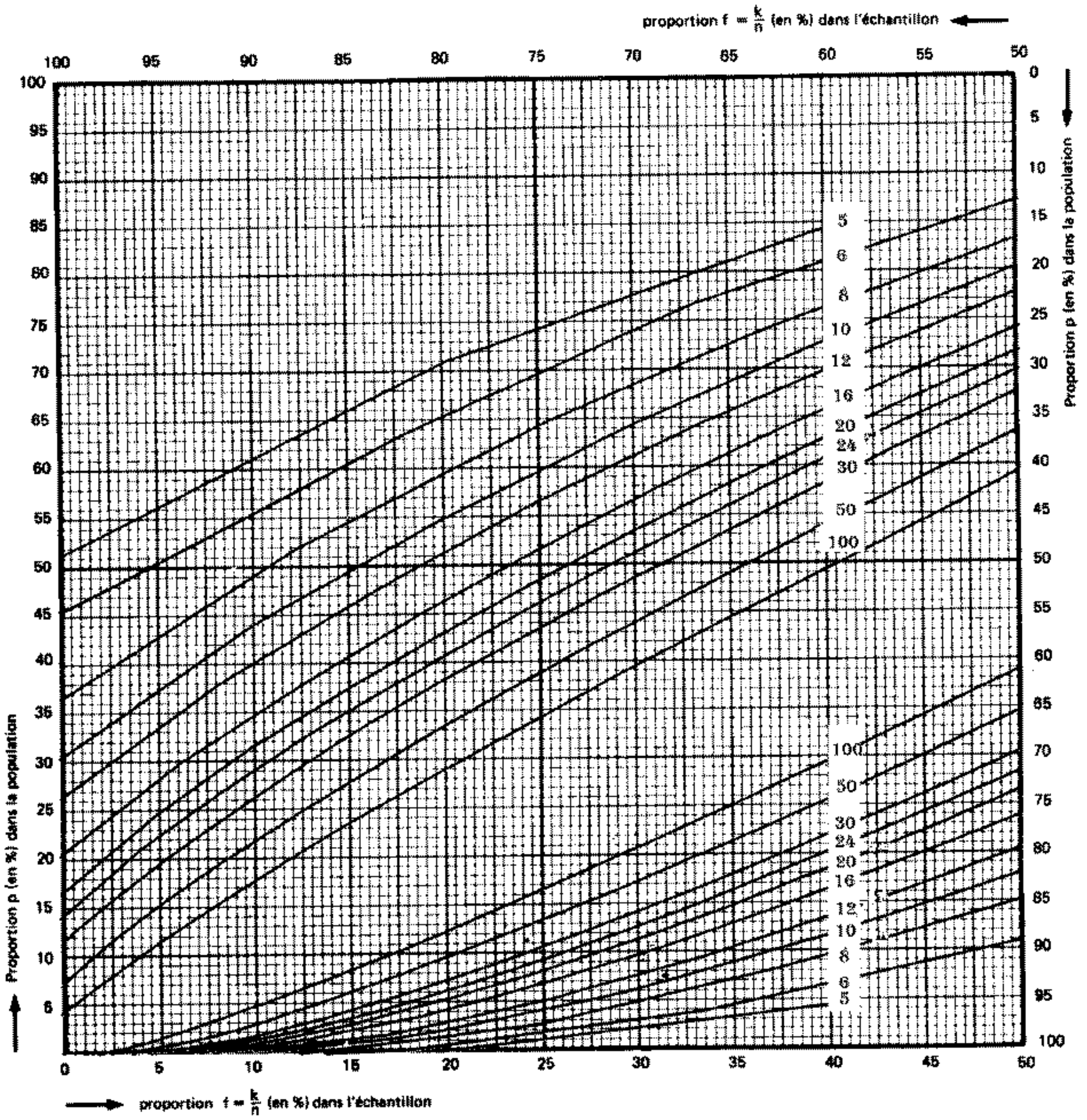
	ν_1																		
ν_2	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	∞
1	4052	4999.5	5403	5625	5764	5859	5928	5982	6022	6056	6106	6157	6209	6235	6261	6287	6313	6339	6366
2	98.50	99.00	99.17	99.25	99.30	99.33	99.36	99.37	99.39	99.40	99.42	99.43	99.45	99.46	99.47	99.47	99.48	99.49	99.59
3	34.12	30.82	29.46	28.71	28.24	27.91	27.67	27.49	27.35	27.23	27.05	26.87	26.69	26.60	26.50	26.41	26.32	26.22	26.12
4	21.20	18.00	16.69	15.98	15.52	15.21	14.98	14.80	14.66	14.55	14.37	14.20	14.02	13.93	13.84	13.75	13.65	13.56	13.46
5	16.26	13.27	12.06	11.39	10.97	10.67	10.46	10.29	10.16	10.05	9.89	9.72	9.55	9.47	9.38	9.29	9.20	9.11	9.02
6	13.75	10.92	9.78	9.15	8.75	8.47	8.26	8.10	7.98	7.87	7.72	7.56	7.40	7.31	7.23	7.14	7.06	6.97	6.88
7	12.25	9.55	8.45	7.85	7.46	7.19	6.99	6.84	6.72	6.62	6.47	6.31	6.16	6.07	5.99	5.91	5.82	5.74	5.65
8	11.26	8.65	7.59	7.01	6.63	6.37	6.18	6.03	5.91	5.81	5.67	5.52	5.36	5.28	5.20	5.12	5.03	4.95	4.86
9	10.56	8.02	6.99	6.42	6.06	5.80	5.61	5.47	5.35	5.26	5.11	4.96	4.81	4.73	4.65	4.57	4.48	4.40	4.31
10	10.04	7.56	6.55	5.99	5.64	5.39	5.20	5.06	4.94	4.85	4.71	4.56	4.41	4.33	4.25	4.17	4.08	4.00	3.91
11	9.65	7.21	6.22	5.67	5.32	5.07	4.89	4.74	4.63	4.54	4.40	4.25	4.10	4.02	3.94	3.86	3.78	3.69	3.60
12	9.33	6.93	5.95	5.41	5.06	4.82	4.64	4.50	4.39	4.30	4.16	4.01	3.86	3.78	3.70	3.62	3.54	3.45	3.36
13	9.07	6.70	5.74	5.21	4.86	4.62	4.44	4.30	4.19	4.10	3.96	3.82	3.66	3.59	3.51	3.43	3.34	3.25	3.17
14	8.86	6.51	5.56	5.04	4.69	4.46	4.28	4.14	4.03	3.94	3.80	3.66	3.51	3.43	3.35	3.27	3.18	3.09	3.00
15	8.68	6.36	5.42	4.89	4.56	4.32	4.14	4.00	3.89	3.80	3.67	3.52	3.37	3.29	3.21	3.13	3.05	2.96	2.87
16	8.53	6.23	5.29	4.77	4.44	4.20	4.03	3.89	3.78	3.69	3.55	3.41	3.26	3.18	3.10	3.02	2.93	2.84	2.75
17	8.40	6.11	5.18	4.67	4.34	4.10	3.93	3.79	3.68	3.59	3.46	3.31	3.16	3.08	3.00	2.92	2.83	2.75	2.65
18	8.29	6.01	5.09	4.58	4.25	4.01	3.84	3.71	3.60	3.51	3.37	3.23	3.08	3.00	2.92	2.84	2.75	2.66	2.57
19	8.18	5.93	5.01	4.50	4.17	3.94	3.77	3.63	3.52	3.43	3.30	3.15	3.00	2.92	2.84	2.76	2.67	2.58	2.49
20	8.10	5.85	4.94	4.43	4.10	3.87	3.70	3.56	3.46	3.37	3.23	3.09	2.94	2.86	2.78	2.69	2.61	2.52	2.42
21	8.02	5.78	4.87	4.37	4.04	3.81	3.64	3.51	3.40	3.31	3.17	3.03	2.88	2.80	2.72	2.64	2.55	2.46	2.36
22	7.95	5.72	4.82	4.31	3.99	3.76	3.59	3.45	3.35	3.26	3.12	2.98	2.83	2.75	2.67	2.58	2.50	2.40	2.31
23	7.88	5.66	4.76	4.26	3.94	3.71	3.54	3.41	3.30	3.21	3.07	2.93	2.78	2.70	2.62	2.54	2.45	2.35	2.26
24	7.82	5.61	4.72	4.22	3.90	3.67	3.50	3.36	3.26	3.17	3.03	2.89	2.74	2.66	2.58	2.49	2.40	2.31	2.21
25	7.77	5.57	4.68	4.18	3.85	3.63	3.46	3.32	3.22	3.13	2.99	2.85	2.70	2.62	2.54	2.45	2.36	2.27	2.17
26	7.72	5.53	4.64	4.14	3.82	3.59	3.42	3.29	3.18	3.09	2.96	2.81	2.66	2.58	2.50	2.42	2.33	2.23	2.13
27	7.68	5.49	4.60	4.11	3.78	3.56	3.39	3.26	3.15	3.06	2.93	2.78	2.63	2.55	2.47	2.38	2.29	2.20	2.10
28	7.64	5.45	4.57	4.07	3.75	3.53	3.36	3.23	3.12	3.03	2.90	2.75	2.60	2.52	2.44	2.35	2.26	2.17	2.06
29	7.60	5.42	4.54	4.04	3.73	3.50	3.33	3.20	3.09	3.00	2.87	2.73	2.57	2.49	2.41	2.33	2.23	2.14	2.03
30	7.56	5.39	4.51	4.02	3.70	3.47	3.30	3.17	3.07	2.98	2.84	2.70	2.55	2.47	2.39	2.30	2.21	2.11	2.01
40	7.31	5.18	4.31	3.83	3.51	3.29	3.12	2.99	2.89	2.80	2.66	2.52	2.37	2.29	2.20	2.11	2.02	1.92	1.80
60	7.08	4.98	4.13	3.65	3.34	3.12	2.95	2.82	2.72	2.63	2.50	2.35	2.20	2.12	2.03	1.94	1.84	1.73	1.60
120	6.85	4.79	3.95	3.48	3.17	2.96	2.79	2.66	2.56	2.47	2.34	2.19	2.03	1.95	1.86	1.76	1.66	1.53	1.38
∞	6.63	4.61	3.78	3.32	3.02	2.80	2.64	2.51	2.41	2.32	2.18	2.04	1.88	1.79	1.70	1.59	1.47	1.32	1.00

2 Intervalles de confiance pour une proportion

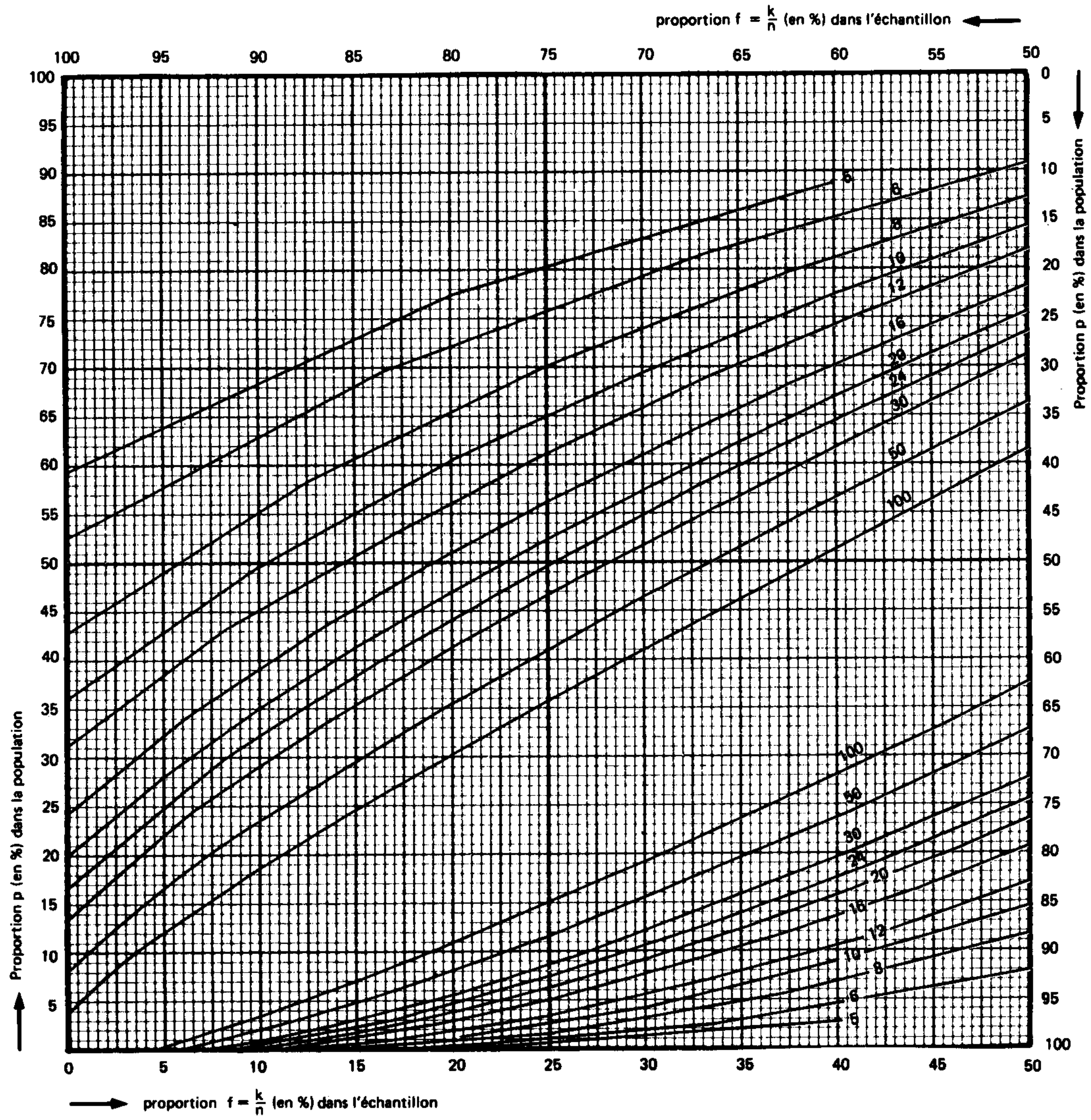
2.1 Intervalle bilatéral ($1-\alpha=0.90$) et intervalle unilatéral ($1-\alpha=0.95$)



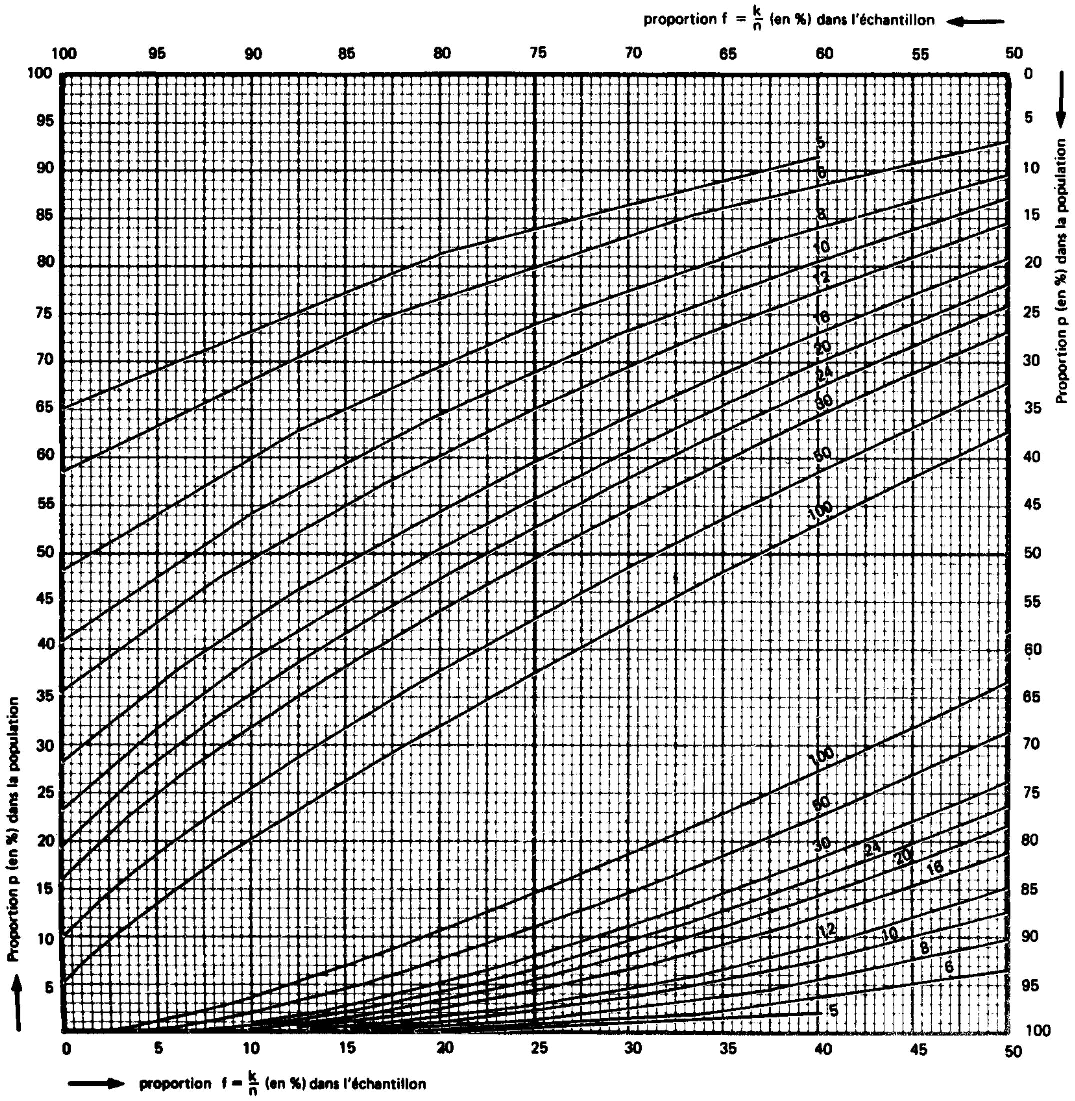
2.2 Intervalle bilatéral $(1-\alpha=0.95)$ et intervalle unilatéral $(1-\alpha=0.975)$



2.3 Intervalle bilatéral $(1-\alpha = 0.98)$ et intervalle unilatéral $(1-\alpha = 0.99)$

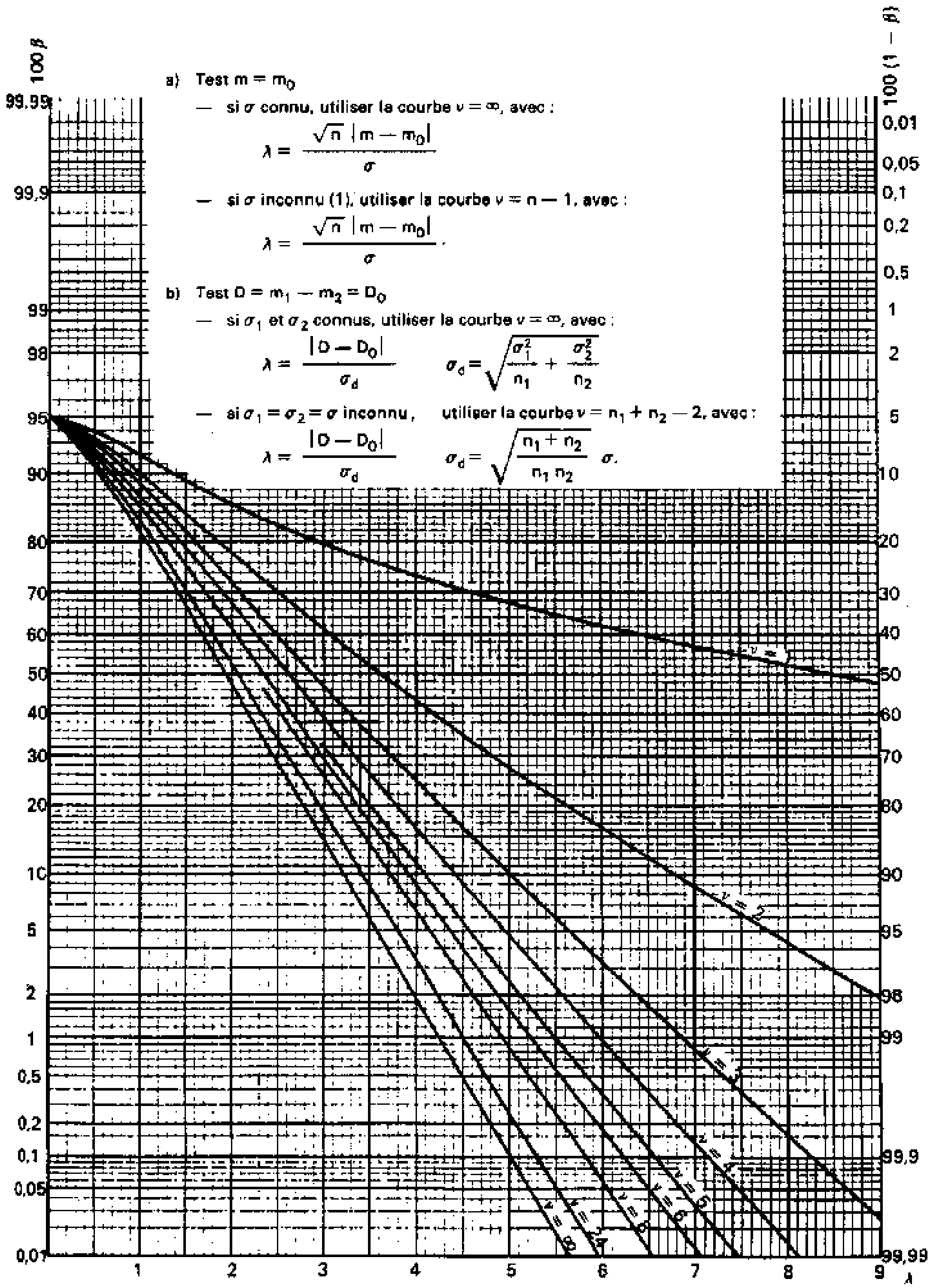


2.4 Intervalle bilatéral $(1-\alpha = 0.99)$ et intervalle unilatéral $(1-\alpha = 0.995)$

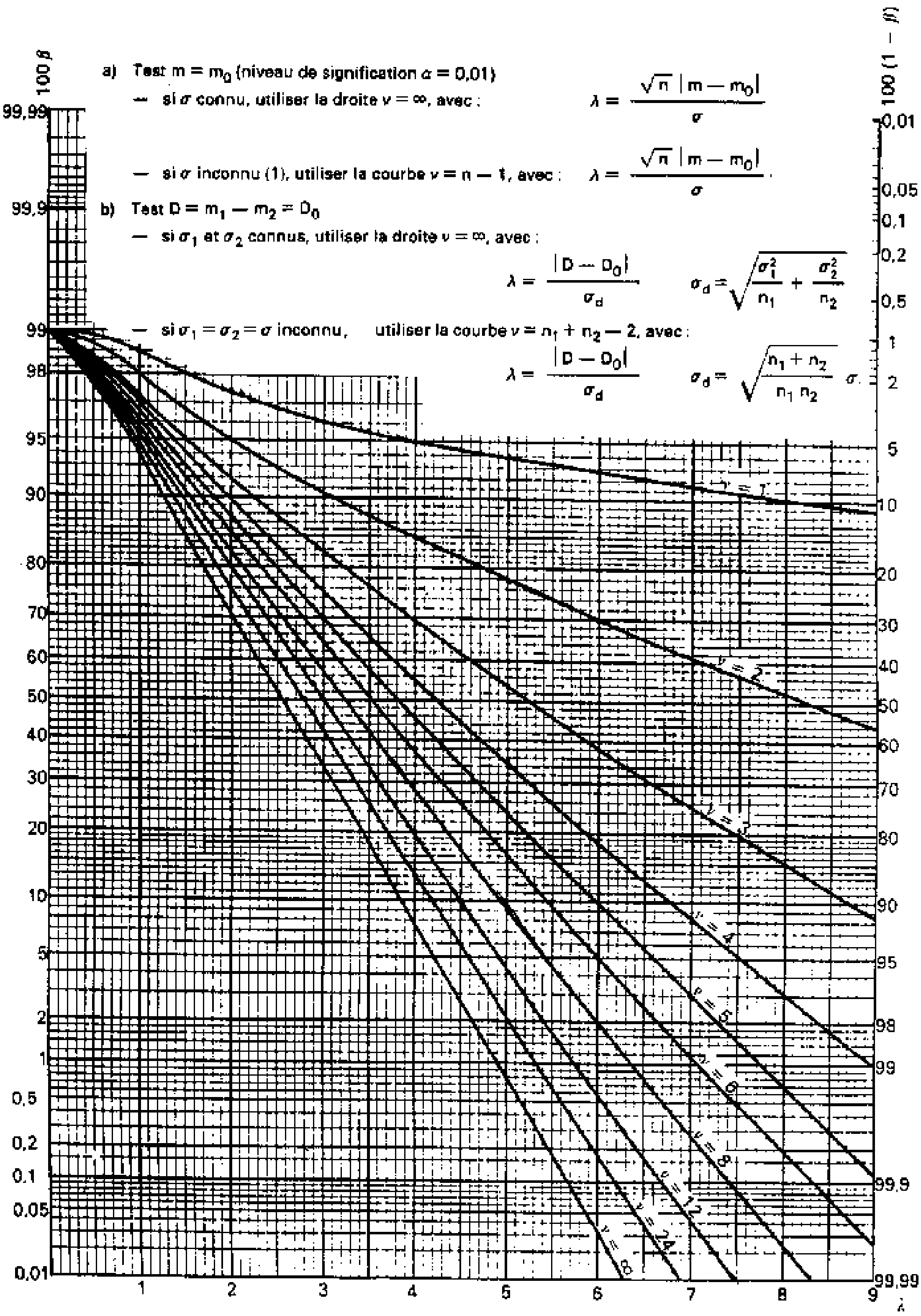


3 Puissance du test de Student

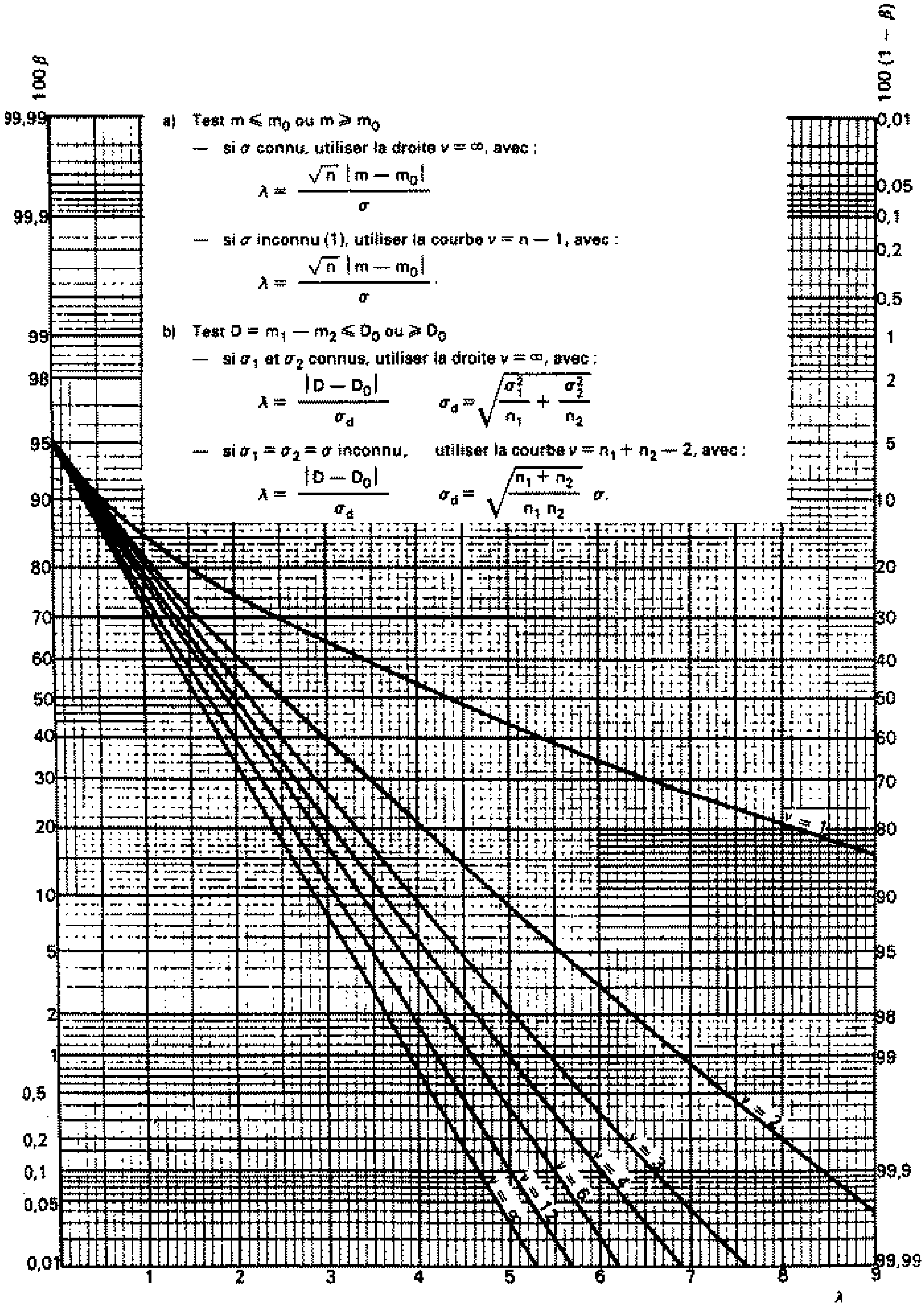
3.1 Tests bilatéraux pour $\alpha = 0.05$



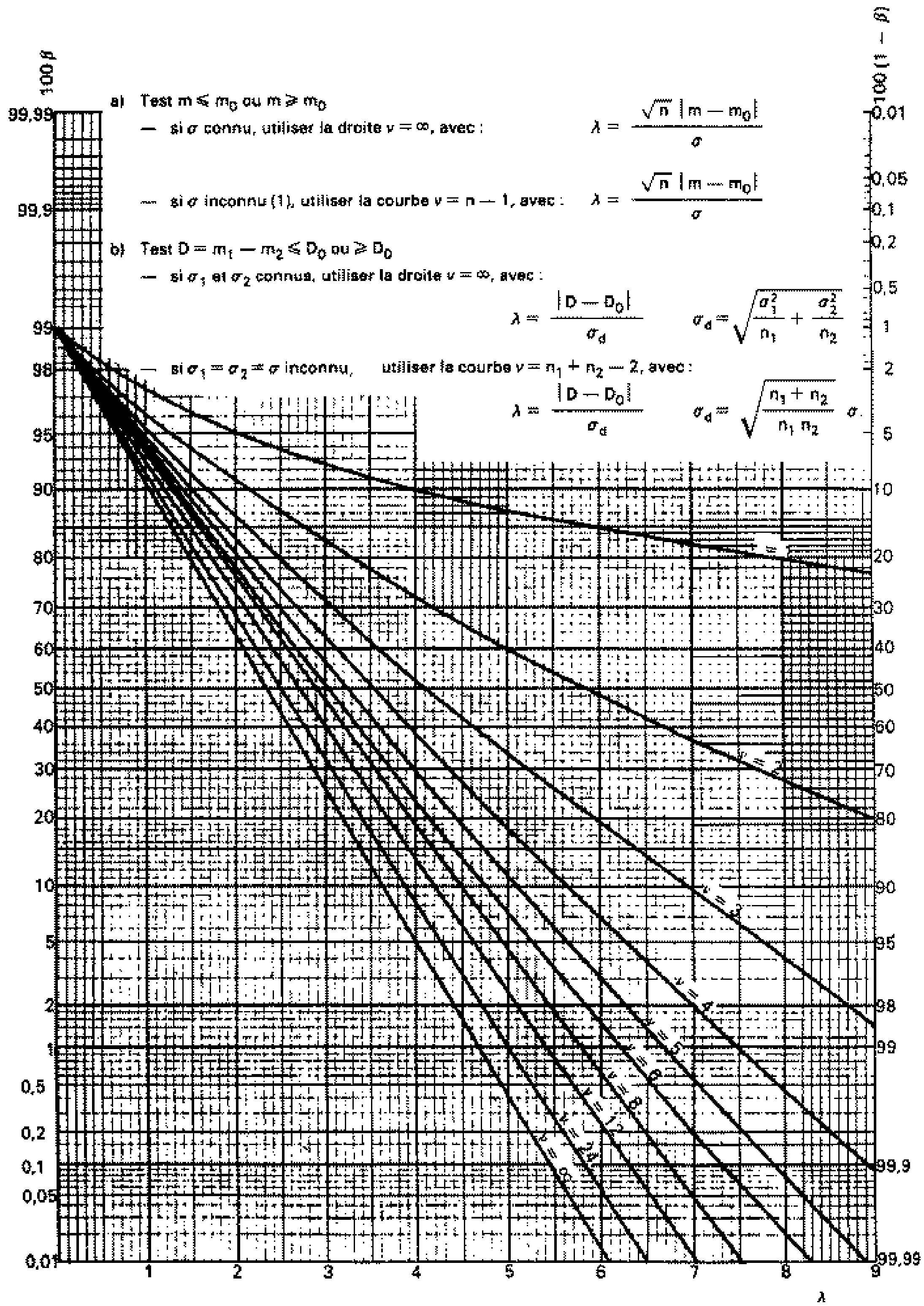
3.2 Tests bilatéraux pour $\alpha = 0.01$



3.3 Tests unilatéraux pour $\alpha = 0.05$



3.4 Tests unilatéraux pour $\alpha = 0.01$



4 Test de Wilcoxon

Soient $X_1, \dots, X_{n_1}$ et $Y_1, \dots, Y_{n_2}$ les deux échantillons. Par convention on suppose $n_1 \leq n_2$. On note W_X la somme des rangs des observations issues de l'échantillon de X.

4.1 Test bilatéral

On rejette $H_0 : F_X = F_Y$ par rapport à $H_1 : F_X \neq F_Y$ si $W_X \leq B$ ou $W_X \geq n_1(n_1+n_2+1) - B$, B étant la valeur lue dans la table.

$\alpha = 5\%$

n_2 \ n_1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
4			10											
5		6	11	17										
6		7	12	18	26									
7		7	13	20	27	36								
8	3	8	14	21	29	38	49							
9	3	8	15	22	31	40	51	63						
10	3	9	15	23	32	42	53	65	78					
11	4	9	16	24	34	44	55	68	81	96				
12	4	10	17	26	35	46	58	71	85	99	115			
13	4	10	18	27	37	48	60	73	88	103	119	137		
14	4	11	19	28	38	50	63	76	91	106	123	141	160	
15	4	11	20	29	40	52	65	79	94	110	127	145	164	185
16	4	12	21	31	42	54	67	82	97	114	131	150	169	190
17	5	12	21	32	43	56	70	84	100	117	135	154	175	195
18	5	13	22	33	45	58	72	87	103	121	139	159	179	201
19	5	13	23	34	46	60	74	90	107	124	144	163	184	205
20	5	14	24	35	48	62	77	93	110	128	148	168	189	211
21	6	14	25	37	50	64	79	95	114	132	152	172	194	216
22	6	15	26	38	51	66	82	99	117	136	156	177	199	222
23	6	15	27	39	53	68	85	102	120	139	160	181	203	226
24	6	16	28	40	55	70	87	104	123	143	164	185	208	232
25	6	16	28	42	57	72	89	107	126	146	168	190	213	237
26	7	17	29	43	58	74	92	110	129	150	172	194	218	242
27	7	17	31	45	60	76	94	113	133	154	176	199	223	247
28	7	19	32	46	62	78	96	116	136	157	180	203	228	253

$\alpha = 1\%$

n_2 \ n_1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
5				15										
6			10	16	23									
7			10	17	24	31								
8			11	17	25	34	43							
9		6	11	18	26	35	45	56						
10		6	12	19	27	37	47	58	71					
11		6	12	20	28	38	49	61	74	87				
12		7	13	21	30	40	51	63	76	90	106			
13		7	14	22	31	41	53	65	79	93	109	125		
14		7	14	22	32	43	54	67	81	96	112	129	147	
15		8	15	23	33	44	56	70	84	99	115	133	151	171
16		8	15	24	34	46	58	72	86	102	119	137	155	175
17		8	16	25	36	47	60	74	89	105	122	140	159	179
18		8	16	26	37	49	62	76	92	108	125	144	163	184
19	3	9	17	27	38	50	64	78	94	111	128	147	167	188
20	3	9	18	28	39	52	66	81	97	113	132	151	171	193
21	3	9	18	29	40	53	68	83	99	116	135	155	175	197
22	3	10	19	29	42	55	70	85	102	119	138	158	179	201
23	3	10	19	30	43	57	71	87	104	122	142	162	184	206
24	3	10	20	31	44	58	73	89	107	125	145	166	188	210
25	3	11	20	32	45	59	75	91	109	128	148	170	192	215
26	3	11	21	32	46	60	76	94	112	131	152	173	196	220
27	4	11	21	33	47	62	78	96	115	134	155	177	200	224
28	4	11	21	34	48	63	80	98	117	137	159	181	204	229

4.2 Test unilatéral

On rejette $H_0 : F_X = F_Y$ par rapport à :

– $H_1 : F_X > F_Y$ si $W_X \leq B$;

– $H_1 : F_X < F_Y$ si $W_X \geq n_1(n_1 + n_2 + 1) - B$,

B étant la valeur lue dans la table.

$\alpha = 5\%$

n_2 \ n_1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2														
3	3	6												
4	3	6	11											
5	3	7	12	19										
6	3	8	13	20	28									
7	3	8	14	21	29	39								
8	4	9	15	23	31	41	51							
9	4	9	16	24	33	43	54	66						
10	4	10	17	26	35	45	56	69	82					
11	4	11	18	27	37	47	59	72	86	100				
12	5	11	19	28	38	49	62	75	89	104	120			
13	5	12	20	30	40	52	64	78	92	108	125	142		
14	5	13	21	31	42	54	67	81	96	112	129	147	166	
15	6	13	22	33	44	56	69	84	99	116	133	152	171	192
16	6	14	24	34	46	58	72	87	103	120	138	156	176	198
17	6	15	25	35	47	61	75	90	106	123	142	161	183	203
18	7	15	26	37	49	63	77	93	110	127	146	167	188	210
19	7	16	27	38	51	65	80	96	113	131	151	171	193	215
20	7	17	28	40	53	67	83	99	117	136	156	176	198	221
21	9	19	30	42	56	71	86	103	121	140	160	181	203	226
22	9	19	31	44	58	73	89	106	125	144	164	186	208	232
23	10	20	32	45	59	75	92	109	128	147	169	190	213	237
24	10	21	33	47	61	77	94	112	131	152	173	195	219	243
25	10	21	34	48	63	79	97	115	135	155	177	200	224	248
26	11	22	35	49	65	82	100	118	138	160	182	205	229	254
27	11	23	36	50	67	83	102	121	142	163	186	209	234	259
28	11	23	37	52	69	86	105	125	145	167	190	214	239	265

$\alpha = 1\%$

n_2 \ n_1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
2														
3														
4			9											
5			10	16										
6		5	11	17	24									
7		6	11	18	25	34								
8		6	12	19	27	35	45							
9		7	13	20	28	37	47	59						
10		7	13	21	29	39	49	61	74					
11		7	14	22	30	40	51	63	77	91				
12	2	8	15	23	32	42	53	66	79	94	109			
13	3	8	15	24	33	44	56	68	82	97	113	130		
14	3	8	16	25	34	45	58	71	85	100	116	134	152	
15	3	9	17	26	36	47	60	73	88	103	120	138	156	176
16	3	9	17	27	37	49	62	76	91	107	124	142	161	181
17	3	10	18	28	39	51	64	78	93	110	127	146	165	185
18	3	10	19	29	40	52	66	81	96	113	131	150	170	191
19	4	10	19	30	41	54	68	83	99	116	135	153	174	195
20	4	11	20	31	43	56	70	85	102	120	138	158	179	200
21	4	11	21	32	44	58	72	88	105	122	142	161	183	205
22	4	11	21	33	45	59	74	91	108	126	145	166	187	210
23	4	12	22	34	47	61	77	93	111	129	149	169	192	214
24	4	12	23	35	48	63	79	95	113	133	153	174	196	219
25	4	13	23	36	49	64	81	97	116	135	156	177	201	224
26	4	13	24	37	51	66	83	100	119	139	160	182	205	229
27	5	13	25	37	52	67	85	102	122	142	164	185	209	233
28	5	13	25	39	54	70	87	105	125	145	l67	190	214	239

5 Test de Wilcoxon signé

Soit M la médiane de $Y - X$, et W_+ la somme des rangs des différences positives. On rejette $H_0 : M = 0$ par rapport à :

- $H_1 : M < 0$ si $W_+ \leq B$;
- $H_1 : M > 0$ si $W_+ \geq n(n+1)/2 - B$;
- $H_1 : M \neq 0$ si $W_+ \leq B$ ou $W_+ \geq n(n+1)/2 - B$,

B étant la valeur lue dans l'une des tables ci-dessous (test unilatéral ou bilatéral).

Test bilatéral			Tests unilatéraux		
n	risque 5%	risque 1%	n	risque 5%	risque 1%
6	0		6	2	
7	2		7	2	
8	3	0	8	5	
9	5	1	9	8	2
10	8	3	10	10	4
11	10	5	11	13	7
12	13	9	12	17	9
13	17	9	13	21	12
14	21	12	14	25	15
15	25	15	15	30	19
16	29	19	16	35	23
17	34	23	17	41	27
18	40	27	18	47	32
19	46	32	19	53	37
20	52	37	20	60	43
21	59	43	21	68	48
22	66	49	22	75	53
23	73	55	23	83	61
24	81	61	24	92	68
25	89	68	25	101	76

6 Distribution de Kolmogorov-Smirnov

$d_{n,1-\alpha}$

$1-\alpha$ / n	.80	.85	.90	.95	.99
1	.900	.925	.950	.975	.995
2	.684	.726	.776	.842	.929
3	.565	.597	.642	.708	.829
4	.494	.525	.564	.624	.734
5	.446	.474	.510	.563	.669
6	.410	.436	.470	.521	.618
7	.381	.405	.438	.486	.577
8	.358	.381	.411	.457	.543
9	.339	.360	.388	.432	.514
10	.322	.342	.368	.409	.486
11	.307	.326	.352	.391	.468
12	.295	.313	.338	.375	.450
13	.254	.302	.325	.361	.433
14	.274	.292	.314	.349	.418
15	.266	.283	.304	.338	.404
16	.258	.274	.295	.328	.391
17	.250	.266	.286	.318	.380
18	.244	.259	.278	.309	.370
19	.237	.252	.272	.301	.361
20	.231	.246	.264	.294	.352
25	.21	.22	.24	.264	.32
30	.19	.20	.22	.242	.29
35	.18	.19	.21	.23	.27
40				.21	.25
50				.19	.23
60				.17	.21
70				.16	.19
80				.15	.18
90				.14	
100				.14	
∞	$\frac{1.07}{\sqrt{n}}$	$\frac{1.14}{\sqrt{n}}$	$\frac{1.22}{\sqrt{n}}$	$\frac{1.36}{\sqrt{n}}$	$\frac{1.63}{\sqrt{n}}$

7 Formulaire

Probabilités

Définitions

Expérience aléatoire	expérience dont le résultat ne peut être prévu a priori
Espace fondamental	ensemble des résultats d'une expérience aléatoire (souvent noté Ω)
Événement aléatoire	événement vrai ou faux suivant le résultat d'une expérience aléatoire ($\subset \Omega$)
Tribu $\mathcal{A}$ sur Ω	$\Omega \in \mathcal{A}$ $\quad A \in \mathcal{A} \Rightarrow \overline{A} \in \mathcal{A}$ $\quad \bigcup_{n\in\mathbb{N}} A_n \in \mathcal{A}$
Probabilité sur $(\Omega, \mathcal{A})$	$\mathbb{P} : \mathcal{A} \to [0,1]$ tq $\mathbb{P}(\Omega) = 1$ et A_i incompatibles $\Rightarrow \mathbb{P}(\bigcup A_i) = \sum \mathbb{P}(A_i)$
Proba. conditionnelle	$\mathbb{P}(A\|B) = \frac{\mathbb{P}(A\cap B)}{\mathbb{P}(B)}$
Indépendance	A et B ind. si $\mathbb{P}(A \cap B) = \mathbb{P}(A)\mathbb{P}(B)$
Indép. mutuelle	$A_1, \ldots, A_n$ mut. ind. si $\forall I \subset \{1, \ldots, n\} \Longrightarrow \mathbb{P}(\bigcap_{i\in I} A_i) = \prod_{i\in I} \mathbb{P}(A_i)$

Propriétés

	$\mathbb{P}(\emptyset) = 0$ $\quad \mathbb{P}(\overline{A}) = 1 - \mathbb{P}(A)$ $\quad A \subset B \Rightarrow \mathbb{P}(A) \leq \mathbb{P}(B)$
	$\mathbb{P}(A \cup B) = \mathbb{P}(A) + \mathbb{P}(B) - \mathbb{P}(A \cap B)$ $\quad \mathbb{P}(\cup A_i) \leq \sum \mathbb{P}(A_i)$
Th. de Bayes	$\mathbb{P}(B\|A) = \frac{\mathbb{P}(A\|B)\mathbb{P}(B)}{\mathbb{P}(A)}$ et $(B_1, \ldots, B_n)$ partition de $\Omega \Rightarrow \mathbb{P}(B_i\|A) = \frac{\mathbb{P}(A\|B_i)\mathbb{P}(B_i)}{\sum_j \mathbb{P}(A\|B_j)\mathbb{P}(B_j)}$

Variables aléatoires

Variable aléatoire	application mesurable de $(\Omega, \mathcal{A}, P)$ dans $(\mathbb{R}, \mathcal{B})$
Loi de probabilité	$\mathbb{P}_X(B) = \mathbb{P}(\{\omega \in \Omega \| X(\omega) \in B\}) = \mathbb{P}(X^{-1}(B))$ notée $\mathbb{P}(X \in B)$
	discret : $p(x) = \mathbb{P}(X = x)$ et $\mathbb{P}(X \in B) = \sum_{x\in B} p(x)$
	continu : densité f et $\mathbb{P}(X \in I) = \int_I f(x)dx$
F. de répartition	$F(x) = \mathbb{P}(X \leq x)$, F continue à droite et croissante de de 0 à 1, $F' = f$ pour 1 v.a. continue
F. d'1 v.a. $\varphi(X)$	discret : $p(a) = \sum_{\{x\|\varphi(x)=a\}} p(x)$
	continu : $G = F \circ \varphi^{-1}$ (φ strictement crois.) ou $G = 1 - F \circ \varphi^{-1}$ (φ strictement déc.)
Espérance	$\mathbb{E}(X) = \sum xp(x)$ ou $\int xf(x)dx$ et $\mathbb{E}(\varphi(X)) = \sum \varphi(x)p(x)$ ou $\int \varphi(x)f(x)dx$
Variance et covariance	$\mathrm{Var}(X) = \mathbb{E}([X - \mathbb{E}(X)]^2) = \mathbb{E}(X^2) - [\mathbb{E}(X)]^2$
	$\mathrm{Cov}(X, Y) = \mathbb{E}[(X - \mathbb{E}(X))(Y - \mathbb{E}(Y))] = \mathbb{E}(XY) - \mathbb{E}(X)\mathbb{E}(Y)$
Moments d'ordre k	non centré $m_k = \mathbb{E}(X^k)$, centré $\mu_k = \mathbb{E}([X - E(X)]^k)$
V. a. indépendantes	discret : $p(x_1, \ldots, x_n) = p(x_1) \ldots p(x_n)$
	continu : $f(x_1, \ldots, x_n) = f(x_1) \ldots f(x_p)$ ou $F(x_1, \ldots, x_n) = \prod_{i=1}^n F(x_i)$
	$\mathbb{E}(X_1 \ldots X_n) = \mathbb{E}(X_1) \ldots \mathbb{E}(X_n)$, $\mathrm{Cov}(X, Y) = 0$, $\mathrm{Var}(\sum X_i) = \sum \mathrm{Var}(X_i)$

Lois de probabilités

Lois discrètes

Loi	notations	$p(x)$	Domaine	$\mathbb{E}(X)$	$\mathrm{Var}(X)$	
uniforme	$\mathcal{U}(n)$	$1/n$	$\{1, \ldots, n\}$	$(n + 1)/2$	$(n^2 - 1)/12$	$n \in \mathbb{N}^*$
Bernoulli	$\mathcal{B}(1, p)$	$p^x(1 - p)^{1-x}$	$\{0, 1\}$	p	$p(1 - p)$	$p \in]0, 1[$
binomiale	$\mathcal{B}(n, p)$	$C_n^x p^x(1 - p)^{n-x}$	$\{0, \ldots, n\}$	np	$np(1 - p)$	$n \in \mathbb{N}$, $p \in]0, 1[$
Poisson	$\mathcal{P}(\lambda)$	$e^{-\lambda} \frac{\lambda^x}{x!}$	$\mathbb{N}$	λ	λ	$\lambda \in \mathbb{R}^{+*}$

Lois continues

Loi	notations	$f(x)$	Domaine	$\mathbb{E}(X)$	$\mathrm{Var}(X)$	
uniforme	$\mathcal{U}_{[a,b]}$	$\frac{1}{b-a} 1_{[a,b]}(x)$	$\mathbb{R}$	$\frac{a+b}{2}$	$\frac{(b-a)^2}{12}$	$a, b \in \mathbb{R}$ et $b > a$
normale	$\mathcal{N}(\mu, \sigma^2)$	$\frac{1}{\sqrt{2\pi\sigma^2}} e^{-\frac{1}{2}(\frac{x-\mu}{\sigma})^2}$	$\mathbb{R}$	μ	σ^2	$\mu, \sigma \in \mathbb{R}$
chi-deux	χ_n^2		$\mathbb{R}_+$	n	$2n$	$\sum_1^n (\mathcal{N}(0, 1))^2$
exponent.	$\mathcal{E}(\theta)$	$\theta e^{-\theta x}$	$\mathbb{R}_+$	$1/\theta$	$1/\theta^2$	$\theta \in \mathbb{R}^{+*}$
Student	$\mathcal{T}_n$		$\mathbb{R}$	0 $(n > 1)$	$\frac{n}{n-2}$ $(n > 2)$	$\mathcal{N}(0, 1)/\sqrt{\frac{\chi_n^2}{n}}$
Fisher	$\mathcal{F}_{n,m}$		$\mathbb{R}_+$	$\frac{m}{m-2}$	$\frac{2m^2(n+m-2)}{n(m-4)(m-2)^2}$	$(\frac{\chi_n^2}{n})/(\frac{\chi_m^2}{m})$

Convergence stochastique

Définitions

en probabilité	$(X_n) \xrightarrow{P} a$ $\quad \forall \epsilon$ et η, $\exists n_0$ tel que $n > n_0$ entraîne $\mathbb{P}(\|X_n - a\| > \epsilon) < \eta$
	$(X_n) \xrightarrow{P} X$ $\quad (X_n - X) \xrightarrow{P} 0$
en loi	$(X_n) \xrightarrow{L} X$ $\quad F_n(x) \to F(x)$ en tout point x de continuité de F

Propriétés

	Cvg en probabilité $\Longrightarrow$ Cvg en loi
	$\mathbb{E}(X_n) \to a$ et $\mathrm{Var}(X_n) \to 0 \Longrightarrow (X_n) \xrightarrow{P} a$
	Th. de Slutsky : $\left.\begin{array}{l} X_n \xrightarrow{L} X \\ Y_n \xrightarrow{P} a \end{array}\right\} \Longrightarrow \left\{\begin{array}{l} X_n + Y_n \xrightarrow{L} X + a \\ X_nY_n \xrightarrow{L} aX \\ \frac{X_n}{Y_n} \xrightarrow{L} \frac{X}{a} \quad si\ a \neq 0. \end{array}\right.$

Échantillon

Statistiques usuelles d'un échantillon iid $X_1, \ldots, X_n$ ($E(X) = \mu$ $\mathrm{Var}(X) = \sigma^2$)

$\overline{X} = \frac{1}{n}\sum_i X_i$ $\quad \mathbb{E}(\overline{X}) = \mu$ $\quad \mathrm{Var}(\overline{X}) = \frac{\sigma^2}{n}$ $\quad$ LGN : $\overline{X} \xrightarrow{P} \mu$ $\quad$ TLC : $\frac{\overline{X}-\mu}{\sigma/\sqrt{n}} \xrightarrow{L} \mathcal{N}(0,1)$

$S^{*2} = \frac{1}{n-1}\sum_i (X_i - \overline{X})^2 = \frac{1}{n-1}(\sum_i X_i^2 - n\overline{X}^2)$ $\quad \mathbb{E}(S^{*2}) = \sigma^2$

$\widehat{F}(x) = \frac{1}{n}\mathrm{card}\{i : X_i \leq x\}$

Fractile empirique : $\widehat{f}_\alpha = \begin{cases} X_{(n\alpha)} & \text{si } n\alpha \in \mathbb{N}, \\ X_{(\lfloor n\alpha \rfloor + 1)} & \text{sinon.} \end{cases}$

Fonctions pivotales associées à un échantillon iid gaussien de taille n

μ	$\frac{\overline{X}-\mu}{\frac{\sigma}{\sqrt{n}}} \sim \mathcal{N}(0,1)$ si σ^2 connue	$\frac{\overline{X}-\mu}{\frac{S^*}{\sqrt{n}}} \sim \mathcal{T}_{n-1}$ si σ^2 inconnue
σ^2	$\frac{\sum(X_i-\mu)^2}{\sigma^2} \sim \chi^2_n$ si μ connue	$\frac{(n-1)S^{*2}}{\sigma^2} \sim \chi^2_{n-1}$ si μ inconnue

Fonctions pivotales associées à 2 échantillons gaussiens indépendants de tailles n et m

$(\frac{S^{*2}_X}{\sigma^2_X})/(\frac{S^{*2}_Y}{\sigma^2_Y}) \sim \mathcal{F}_{n-1,m-1}$ $\qquad \frac{\overline{X}-\overline{Y}-(\mu_X-\mu_Y)}{S^*\sqrt{\frac{1}{n}+\frac{1}{m}}} \sim \mathcal{T}_{n+m-2}$ (si même variance) où $S^{*2} = \frac{(n-1)S^{*2}_X+(m-1)S^{*2}_Y}{n+m-2}$

Estimation

Précision d'un estimateur	$\mathbb{E}[(\hat{\theta}-\theta)^2]$
Borne de Fréchet	$B_F[u(\theta)] = \frac{(u'(\theta))^2}{I_n(\theta)}$ où $I_n(\theta) = \mathbb{E}\left[(\frac{\partial \ln L}{\partial \theta})^2\right] = -\mathbb{E}(\frac{\partial^2 \ln L}{\partial \theta^2})$

CNS d'efficacité : $\frac{\partial \ln L}{\partial \theta}(\theta; X_1, \ldots, X_n) = A(n,\theta)(\hat{u} - u(\theta))$ (on a $\mathrm{Var}(\hat{u}) = \frac{u'(\theta)}{A(n,\theta)}$)

Tests

Tests non paramétriques

$\mathbb{E}(W_X) = \frac{n(n+m+1)}{2}$ et $\mathrm{Var}(W_X) = \frac{nm(n+m+1)}{12}$

$\mathbb{E}(W_+) = \frac{n(n+1)}{4}$ et $\mathrm{Var}(W_+) = \frac{n(n+1)(2n+1)}{24}$

Test du χ^2

$$D^2 = \sum_{k=1}^K \frac{(N_k - np_{k0})^2}{np_{k0}} = \sum_{k=1}^K \frac{N_k^2}{np_{k0}} - n \overset{H_0}{\sim} \chi^2_{K-1}$$

Tableaux de contingence : $D^2 = \sum_{i=1}^r \sum_{j=1}^s \frac{\left(N_{ij} - \frac{N_{i.}N_{.j}}{n}\right)^2}{\frac{N_{i.}N_{.j}}{n}} = \sum_{i=1}^r \sum_{j=1}^s \frac{N_{ij}^2}{\frac{N_{i.}N_{.j}}{n}} - n \overset{H_0}{\sim} \chi^2_{(r-1)(s-1)}$

Test de Kolmogorov-Smirnov

$$D_n = \max_{1\leq i\leq n} \max\left(\left|\widehat{F}(x_i) - F_0(x_i)\right|, \left|\widehat{F}(x_i^-) - F_0(x_i)\right|\right)$$

Test de normalité

Région critique pour $\alpha = 0.05$: $(\sqrt{n} + \frac{0.85}{\sqrt{n}} - 0.01)D_n > 0.895$

Région critique pour $\alpha = 0.01$: $(\sqrt{n} + \frac{0.85}{\sqrt{n}} - 0.01)D_n > 1.035$

Analyse de la variance

Région critique du test de Bartlett : $(N-K)\ln(MSW) - \sum_{k=1}^K (n_k - 1)\ln(S_k^{*2}) > \chi^2_{K-1,1-\alpha}$

$SSW = \sum_k \sum_i (X_k^i - \overline{X}_k)^2 = \sum_k (n_k - 1)S_k^{*2}$ et $MSW = \frac{SSW}{N-K}$

$SSB = \sum_k n_k(\overline{X}_k - \overline{X})^2$ et $MSB = \frac{SSB}{K-1}$

Sous H_0 : $\frac{MSB}{MSW} \sim \mathcal{F}_{K-1,N-K}$

Procédure LSD : μ_k et μ_l significativement différents si $\frac{|\overline{X}_k - \overline{X}_l|}{\sqrt{MSW(1/n_k + 1/n_l)}} > t_{N-K;1-(\alpha^*/2)}$

Régression

$\widehat{b} = \frac{S_{xY}}{s_x^2}$ et $\widehat{a} = \overline{Y} - \frac{S_{xY}}{s_x^2}\overline{x}$

$\widehat{a} \sim \mathcal{N}(a, \frac{\sigma^2}{n}(1 + \frac{\overline{x}^2}{s_x^2}))$ et $\widehat{b} \sim \mathcal{N}(b, \frac{\sigma^2}{ns_x^2})$

$S_Y^2 = S_{reg} + S_{res}$ avec $S_{reg} = \frac{1}{n}\sum_{i=1}^n (\widehat{Y}_i - \overline{Y})^2 = \widehat{b}^2 s_x^2 = \frac{S_{xY}^2}{s_x^2}$ et $S_{res} = \frac{1}{n}\sum_{i=1}^n (Y_i - \widehat{Y}_i)^2 = \frac{1}{n}\sum_{i=1}^n \widehat{\varepsilon}_i^2$

$\widehat{\sigma}^2_{MV} = S_{res}$, $\widehat{\sigma}^2 = \frac{n}{n-2}S_{res}$ et $(n-2)\frac{\widehat{\sigma}^2}{\sigma^2} \sim \chi^2_{n-2}$

Intervalle de confiance sur $\mathbb{E}(Y_0)$: $\widehat{Y}_0 \pm t_{n-2;1-\frac{\alpha}{2}}\widehat{\sigma}\sqrt{\frac{1}{n} + \frac{(x_0 - \overline{x})^2}{ns_x^2}}$

Intervalle de prédiction : $\widehat{Y}_0 \pm t_{n-2;1-\frac{\alpha}{2}}\widehat{\sigma}\sqrt{1 + \frac{1}{n} + \frac{(x_0 - \overline{x})^2}{ns_x^2}}$