Table 1 Cumulative Binomial Probabilities

p = probability of success in a single trial; n = number of trials. The table gives the probability of obtaining r *or more* successes in n independent trials. That is

$$\sum_{x=r}^{n} \binom{n}{x} p^x (1-p)^{n-x} .$$

When there is no entry for a particular pair of values of r and p, this indicates that the appropriate probability is less than 0.000 05. Similarly, except for the case $r = 0$, when the entry is exact, a tabulated value of 1.0000 represents a probability greater than 0.999 95.

	$p =$	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
$n = 2$	$r = 0$	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	1	.0199	.0396	.0591	.0784	.0975	.1164	.1351	.1536	.1719
	2	.0001	.0004	.0009	.0016	.0025	.0036	.0049	.0064	.0081
$n = 5$	$r = 0$	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	1	.0490	.0961	.1413	.1846	.2262	.2661	.3043	.3409	.3760
	2	.0010	.0038	.0085	.0148	.0226	.0319	.0425	.0544	.0674
	3		.0001	.0003	.0006	.0012	.0020	.0031	.0045	.0063
	4						.0001	.0001	.0002	.0003
$n = 10$	$r = 0$	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	1	.0956	.1829	.2626	.3352	.4013	.4614	.5160	.5656	.6106
	2	.0043	.0162	.0345	.0582	.0861	.1176	.1517	.1879	.2254
	3	.0001	.0009	.0028	.0062	.0115	.0188	.0283	.0401	.0540
	4			.0001	.0004	.0010	.0020	.0036	.0058	.0088
	5					.0001	.0002	.0003	.0006	.0010
	6									.0001
$n = 20$	$r = 0$	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	1	.1821	.3324	.4562	.5580	.6415	.7099	.7658	.8113	.8484
	2	.0169	.0599	.1198	.1897	.2642	.3395	.4131	.4831	.5484
	3	.0010	.0071	.0210	.0439	.0755	.1150	.1610	.2121	.2666
	4		.0006	.0027	.0074	.0159	.0290	.0471	.0706	.0993
	5			.0003	.0010	.0026	.0056	.0107	.0183	.0290
	6				.0001	.0003	.0009	.0019	.0038	.0068
	7						.0001	.0003	.0006	.0013
	8								.0001	.0002
$n = 50$	$r = 0$	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	1	.3950	.6358	.7819	.8701	.9231	.9547	.9734	.9845	.9910
	2	.0894	.2642	.4447	.5995	.7206	.8100	.8735	.9173	.9468
	3	.0138	.0784	.1892	.3233	.4595	.5838	.6892	.7740	.8395
	4	.0016	.0178	.0628	.1391	.2396	.3527	.4673	.5747	.6697
	5	.0001	.0032	.0168	.0490	.1036	.1794	.2710	.3710	.4723
	6		.0005	.0037	.0144	.0378	.0776	.1350	.2081	.2928
	7		.0001	.0007	.0036	.0118	.0289	.0583	.1019	.1596
	8			.0001	.0008	.0032	.0094	.0220	.0438	.0768
	9				.0001	.0008	.0027	.0073	.0167	.0328
	10					.0002	.0007	.0022	.0056	.0125
	11						.0002	.0006	.0017	.0043
	12							.0001	.0005	.0013
	13								.0001	.0004
	14									.0001

Table 1 Cumulative Binomial Probabilities – continued

	p =	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
n = 100	r = 0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	1	.6340	.8674	.9524	.9831	.9941	.9979	.9993	.9998	.9999
	2	.2642	.5967	.8054	.9128	.9629	.9848	.9940	.9977	.9991
	3	.0794	.3233	.5802	.7679	.8817	.9434	.9742	.9887	.9952
	4	.0184	.1410	.3528	.5705	.7422	.8570	.9256	.9633	.9827
	5	.0034	.0508	.1821	.3711	.5640	.7232	.8368	.9097	.9526
	6	.0005	.0155	.0808	.2116	.3840	.5593	.7086	.8201	.8955
	7	.0001	.0041	.0312	.1064	.2340	.3936	.5557	.6968	.8060
	8		.0009	.0106	.0475	.1280	.2517	.4012	.5529	.6872
	9		.0002	.0032	.0190	.0631	.1463	.2660	.4074	.5506
	10			.0009	.0068	.0282	.0775	.1620	.2780	.4125
	11			.0002	.0022	.0115	.0376	.0908	.1757	.2882
	12				.0007	.0043	.0168	.0469	.1028	.1876
	13				.0002	.0015	.0069	.0224	.0559	.1138
	14					.0005	.0026	.0099	.0282	.0645
	15					.0001	.0009	.0041	.0133	.0341
	16						.0003	.0016	.0058	.0169
	17						.0001	.0006	.0024	.0078
	18							.0002	.0009	.0034
	19							.0001	.0003	.0014
	20								.0001	.0005
	21									.0002
	22									.0001

	p =	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50
n = 2	r = 0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	1	.1900	.2775	.3600	.4375	.5100	.5775	.6400	.6975	.7500
	2	.0100	.0225	.0400	.0625	.0900	.1225	.1600	.2025	.2500
n = 5	r = 0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	1	.4095	.5563	.6723	.7627	.8319	.8840	.9222	.9497	.9688
	2	.0815	.1648	.2627	.3672	.4718	.5716	.6630	.7438	.8125
	3	.0086	.0266	.0579	.1035	.1631	.2352	.3174	.4069	.5000
	4	.0005	.0022	.0067	.0156	.0308	.0540	.0870	.1312	.1875
	5		.0001	.0003	.0010	.0024	.0053	.0102	.0185	.0313
n = 10	r = 0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	1	.6513	.8031	.8926	.9437	.9718	.9865	.9940	.9975	.9990
	2	.2639	.4557	.6242	.7560	.8507	.9140	.9536	.9767	.9893
	3	.0702	.1798	.3222	.4744	.6172	.7384	.8327	.9004	.9453
	4	.0128	.0500	.1209	.2241	.3504	.4862	.6177	.7430	.8281
	5	.0016	.0099	.0328	.0781	.1503	.2485	.3669	.4956	.6230
	6	.0001	.0014	.0064	.0197	.0473	.0949	.1662	.2616	.3770
	7		.0001	.0009	.0035	.0106	.0260	.0548	.1020	.1719
	8			.0001	.0004	.0016	.0048	.0123	.0274	.0547
	9					.0001	.0005	.0017	.0045	.0107
	10							.0001	.0003	.0010
n = 20	r = 0	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	1	.8784	.9612	.9885	.9968	.9992	.9998	1.0000	1.0000	1.0000
	2	.6083	.8244	.9308	.9757	.9924	.9979	.9995	.9999	1.0000
	3	.3231	.5951	.7939	.9087	.9645	.9879	.9964	.9991	.9998
	4	.1330	.3523	.5886	.7748	.8929	.9556	.9840	.9951	.9987
	5	.0432	.1702	.3704	.5852	.7625	.8818	.9490	.9811	.9941
	6	.0113	.0673	.1958	.3828	.5836	.7546	.8744	.9447	.9793
	7	.0024	.0219	.0867	.2142	.3920	.5834	.7500	.8701	.9423
	8	.0004	.0059	.0321	.1018	.2277	.3990	.5841	.7480	.8684
	9	.0001	.0013	.0100	.0409	.1133	.2376	.4044	.5857	.7483
	10		.0002	.0026	.0139	.0480	.1218	.2447	.4086	.5881
	11			.0006	.0039	.0171	.0532	.1275	.2493	.4119
	12			.0001	.0009	.0051	.0196	.0565	.1308	.2517
	13				.0002	.0013	.0060	.0210	.0580	.1316
	14					.0003	.0015	.0065	.0214	.0577
	15						.0003	.0016	.0064	.0207
	16							.0003	.0015	.0059
	17								.0003	.0013
	18									.0002

Table 1 Cumulative Binomial Probabilites – continued

	$p =$	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50
$n = 50$	$r = 0$	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	1	.9948	.9997	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	2	.9662	.9971	.9998	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	3	.8883	.9858	.9987	.9999	1.0000	1.0000	1.0000	1.0000	1.0000
	4	.7497	.9540	.9943	.9995	1.0000	1.0000	1.0000	1.0000	1.0000
	5	.5688	.8879	.9815	.9979	.9998	1.0000	1.0000	1.0000	1.0000
	6	.3839	.7806	.9520	.9930	.9993	.9999	1.0000	1.0000	1.0000
	7	.2298	.6387	.8966	.9806	.9975	.9998	1.0000	1.0000	1.0000
	8	.1221	.4812	.8096	.9547	.9927	.9992	.9999	1.0000	1.0000
	9	.0579	.3319	.6927	.9084	.9817	.9975	.9998	1.0000	1.0000
	10	.0245	.2089	.5563	.8363	.9598	.9933	.9992	.9999	1.0000
	11	.0094	.1199	.4164	.7378	.9211	.9840	.9978	.9998	1.0000
	12	.0032	.0628	.2893	.6184	.8610	.9658	.9943	.9994	1.0000
	13	.0010	.0301	.1861	.4890	.7771	.9339	.9867	.9982	.9998
	14	.0003	.0132	.1106	.3630	.6721	.8837	.9720	.9955	.9995
	15	.0001	.0053	.0607	.2519	.5532	.8122	.9460	.9896	.9987
	16		.0019	.0308	.1631	.4308	.7199	.9045	.9780	.9967
	17		.0007	.0144	.0983	.3161	.6111	.8439	.9573	.9923
	18		.0002	.0063	.0551	.2178	.4940	.7631	.9235	.9836
	19		.0001	.0025	.0287	.1406	.3784	.6644	.8727	.9675
	20			.0009	.0139	.0848	.2736	.5535	.8026	.9405
	21			.0003	.0063	.0478	.1861	.4390	.7138	.8987
	22			.0001	.0026	.0251	.1187	.3299	.6100	.8389
	23				.0010	.0123	.0710	.2340	.4981	.7601
	24				.0004	.0056	.0396	.1562	.3866	.6641
	25				.0001	.0024	.0207	.0978	.2840	.5561
	26					.0009	.0100	.0573	.1966	.4439
	27					.0003	.0045	.0314	.1279	.3359
	28					.0001	.0019	.0160	.0780	.2399
	29						.0007	.0076	.0444	.1611
	30						.0003	.0034	.0235	.1013
	31						.0001	.0014	.0116	.0595
	32							.0005	.0053	.0325
	33							.0002	.0022	.0164
	34							.0001	.0009	.0077
	35								.0003	.0033
	36								.0001	.0013
	37									.0005
	38									.0002

Table 1 gives binomial probabilities only for a limited range of values of n and p since, in practice, either the more compact tabulation of the Poisson distribution (Table 2) or that of the Normal distribution (Table 3) can usually be used to give an adequate approximation.

As a reasonable working rule:

(i) use the Poisson approximation if $p < 0.1$, putting $m = np$

(ii) use the Normal approximation if $0.1 \le p \le 0.9$ and $np > 5$, putting $\mu = np$ and $\sigma = \sqrt{np(1-p)}$.

(iii) use the Poisson approximation if $p > 0.9$, putting $m = n(1-p)$ and working in terms of 'failures'.

Note: For values of $p > 0.5$, work in terms of 'failures' which will have probability $q\ (= 1 - p)$.

Example: What is the probability that 40 or more seeds will germinate out of 50 if the germination rate is 70%? Since the probability of 'success' is greater than 0.5, the table can not be used directly; however, 40 or more successes is the same as 10 or fewer 'failures'. The probability of 10 or fewer 'failures' = 1 – probability of 11 or more 'failures' = 1 – 0.9211 = 0.0789.

Table 1 Cumulative Binomial Probabilities – continued

	$p =$	0.10	0.15	0.20	0.25	0.30	0.35	0.40	0.45	0.50
$n = 100$	$r = 0$	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	1	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	2	.9997	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	3	.9981	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	4	.9922	.9999	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	5	.9763	.9996	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	6	.9424	.9984	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	7	.8828	.9953	.9999	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	8	.7939	.9878	.9997	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	9	.6791	.9725	.9991	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	10	.5487	.9449	.9977	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	11	.4168	.9006	.9943	.9999	1.0000	1.0000	1.0000	1.0000	1.0000
	12	.2970	.8365	.9874	.9996	1.0000	1.0000	1.0000	1.0000	1.0000
	13	.1982	.7527	.9747	.9990	1.0000	1.0000	1.0000	1.0000	1.0000
	14	.1239	.6526	.9531	.9975	.9999	1.0000	1.0000	1.0000	1.0000
	15	.0726	.5428	.9196	.9946	.9998	1.0000	1.0000	1.0000	1.0000
	16	.0399	.4317	.8715	.9889	.9996	1.0000	1.0000	1.0000	1.0000
	17	.0206	.3275	.8077	.9789	.9990	1.0000	1.0000	1.0000	1.0000
	18	.0100	.2367	.7288	.9624	.9978	.9999	1.0000	1.0000	1.0000
	19	.0046	.1628	.6379	.9370	.9955	.9999	1.0000	1.0000	1.0000
	20	.0020	.1065	.5398	.9005	.9911	.9997	1.0000	1.0000	1.0000
	21	.0008	.0663	.4405	.8512	.9835	.9992	1.0000	1.0000	1.0000
	22	.0003	.0393	.3460	.7886	.9712	.9983	1.0000	1.0000	1.0000
	23	.0001	.0221	.2611	.7136	.9521	.9966	.9999	1.0000	1.0000
	24		.0119	.1891	.6289	.9245	.9934	.9997	1.0000	1.0000
	25		.0061	.1314	.5383	.8864	.9879	.9994	1.0000	1.0000
	26		.0030	.0875	.4465	.8369	.9789	.9988	1.0000	1.0000
	27		.0014	.0558	.3583	.7756	.9649	.9976	.9999	1.0000
	28		.0006	.0342	.2776	.7036	.9442	.9954	.9998	1.0000
	29		.0003	.0200	.2075	.6232	.9152	.9916	.9996	1.0000
	30		.0001	.0112	.1495	.5377	.8764	.9852	.9992	1.0000
	31			.0061	.1038	.4509	.8270	.9752	.9985	1.0000
	32			.0031	.0693	.3669	.7669	.9602	.9970	.9999
	33			.0016	.0446	.2893	.6971	.9385	.9945	.9998
	34			.0007	.0276	.2207	.6197	.9087	.9902	.9996
	35			.0003	.0164	.1629	.5376	.8697	.9834	.9991
	36			.0001	.0094	.1161	.4542	.8205	.9728	.9982
	37			.0001	.0052	.0799	.3731	.7614	.9571	.9967
	38				.0027	.0530	.2976	.6932	.9349	.9940
	39				.0014	.0340	.2301	.6178	.9049	.9895
	40				.0007	.0210	.1724	.5379	.8657	.9824
	41				.0003	.0125	.1250	.4567	.8169	.9716
	42				.0001	.0072	.0877	.3775	.7585	.9557
	43				.0001	.0040	.0594	.3033	.6913	.9334
	44					.0021	.0389	.2365	.6172	.9033
	45					.0011	.0246	.1789	.5387	.8644
	46					.0005	.0150	.1311	.4587	.8159
	47					.0003	.0088	.0930	.3804	.7579
	48					.0001	.0050	.0638	.3069	.6914
	49					.0001	.0027	.0423	.2404	.6178
	50						.0015	.0271	.1827	.5398
	51						.0007	.0168	.1346	.4602
	52						.0004	.0100	.0960	.3822
	53						.0002	.0058	.0662	.3086
	54						.0001	.0032	.0441	.2421
	55							.0017	.0284	.1841
	56							.0009	.0176	.1356
	57							.0004	.0106	.0967
	58							.0002	.0061	.0666
	59							.0001	.0034	.0443
	60								.0018	.0284
	61								.0009	.0176
	62								.0005	.0105
	63								.0002	.0060
	64								.0001	.0033
	65									.0018
	66									.0009
	67									.0004
	68									.0002
	69									.0001