

# Statistical Tables



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**Table I Table of Binomial Probabilities**

<i>n</i>	<i>x</i>	<i>p</i>										
		.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
1	0	.9500	.9000	.8000	.7000	.6000	.5000	.4000	.3000	.2000	.1000	.0500
	1	.0500	.1000	.2000	.3000	.4000	.5000	.6000	.7000	.8000	.9000	.9500
2	0	.9025	.8100	.6400	.4900	.3600	.2500	.1600	.0900	.0400	.0100	.0025
	1	.0950	.1800	.3200	.4200	.4800	.5000	.4800	.4200	.3200	.1800	.0950
	2	.0025	.0100	.0400	.0900	.1600	.2500	.3600	.4900	.6400	.8100	.9025
3	0	.8574	.7290	.5120	.3430	.2160	.1250	.0640	.0270	.0080	.0010	.0001
	1	.1354	.2430	.3840	.4410	.4320	.3750	.2880	.1890	.0960	.0270	.0071
	2	.0071	.0270	.0960	.1890	.2880	.3750	.4320	.4410	.3840	.2430	.1354
	3	.0001	.0010	.0080	.0270	.0640	.1250	.2160	.3430	.5120	.7290	.8574
4	0	.8145	.6561	.4096	.2401	.1296	.0625	.0256	.0081	.0016	.0001	.0000
	1	.1715	.2916	.4096	.4116	.3456	.2500	.1536	.0756	.0256	.0036	.0005
	2	.0135	.0486	.1536	.2646	.3456	.3750	.3456	.2646	.1536	.0486	.0135
	3	.0005	.0036	.0256	.0756	.1536	.2500	.3456	.4116	.4096	.2916	.1715
	4	.0000	.0001	.0016	.0081	.0256	.0625	.1296	.2401	.4096	.6561	.8145
5	0	.7738	.5905	.3277	.1681	.0778	.0312	.0102	.0024	.0003	.0000	.0000
	1	.2036	.3280	.4096	.3602	.2592	.1562	.0768	.0284	.0064	.0005	.0000
	2	.0214	.0729	.2048	.3087	.3456	.3125	.2304	.1323	.0512	.0081	.0011
	3	.0011	.0081	.0512	.1323	.2304	.3125	.3456	.3087	.2048	.0729	.0214
	4	.0000	.0004	.0064	.0283	.0768	.1562	.2592	.3601	.4096	.3281	.2036
	5	.0000	.0000	.0003	.0024	.0102	.0312	.0778	.1681	.3277	.5905	.7738
6	0	.7351	.5314	.2621	.1176	.0467	.0156	.0041	.0007	.0001	.0000	.0000
	1	.2321	.3543	.3932	.3025	.1866	.0937	.0369	.0102	.0015	.0001	.0000
	2	.0305	.0984	.2458	.3241	.3110	.2344	.1382	.0595	.0154	.0012	.0001
	3	.0021	.0146	.0819	.1852	.2765	.3125	.2765	.1852	.0819	.0146	.0021
	4	.0001	.0012	.0154	.0595	.1382	.2344	.3110	.3241	.2458	.0984	.0305
	5	.0000	.0001	.0015	.0102	.0369	.0937	.1866	.3025	.3932	.3543	.2321
	6	.0000	.0000	.0001	.0007	.0041	.0156	.0467	.1176	.2621	.5314	.7351
7	0	.6983	.4783	.2097	.0824	.0280	.0078	.0016	.0002	.0000	.0000	.0000
	1	.2573	.3720	.3670	.2471	.1306	.0547	.0172	.0036	.0004	.0000	.0000
	2	.0406	.1240	.2753	.3177	.2613	.1641	.0774	.0250	.0043	.0002	.0000
	3	.0036	.0230	.1147	.2269	.2903	.2734	.1935	.0972	.0287	.0026	.0002
	4	.0002	.0026	.0287	.0972	.1935	.2734	.2903	.2269	.1147	.0230	.0036
	5	.0000	.0002	.0043	.0250	.0774	.1641	.2613	.3177	.2753	.1240	.0406
	6	.0000	.0000	.0004	.0036	.0172	.0547	.1306	.2471	.3670	.3720	.2573
	7	.0000	.0000	.0000	.0002	.0016	.0078	.0280	.0824	.2097	.4783	.6983
8	0	.6634	.4305	.1678	.0576	.0168	.0039	.0007	.0001	.0000	.0000	.0000
	1	.2793	.3826	.3355	.1977	.0896	.0312	.0079	.0012	.0001	.0000	.0000

Table I Table of Binomial Probabilities (continued)

<i>n</i>	<i>x</i>	<i>p</i>										
		.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
	2	.0515	.1488	.2936	.2965	.2090	.1094	.0413	.0100	.0011	.0000	.0000
	3	.0054	.0331	.1468	.2541	.2787	.2187	.1239	.0467	.0092	.0004	.0000
	4	.0004	.0046	.0459	.1361	.2322	.2734	.2322	.1361	.0459	.0046	.0004
	5	.0000	.0004	.0092	.0467	.1239	.2187	.2787	.2541	.1468	.0331	.0054
	6	.0000	.0000	.0011	.0100	.0413	.1094	.2090	.2965	.2936	.1488	.0515
	7	.0000	.0000	.0001	.0012	.0079	.0312	.0896	.1977	.3355	.3826	.2793
	8	.0000	.0000	.0000	.0001	.0007	.0039	.0168	.0576	.1678	.4305	.6634
9	0	.6302	.3874	.1342	.0404	.0101	.0020	.0003	.0000	.0000	.0000	.0000
	1	.2985	.3874	.3020	.1556	.0605	.0176	.0035	.0004	.0000	.0000	.0000
	2	.0629	.1722	.3020	.2668	.1612	.0703	.0212	.0039	.0003	.0000	.0000
	3	.0077	.0446	.1762	.2668	.2508	.1641	.0743	.0210	.0028	.0001	.0000
	4	.0006	.0074	.0661	.1715	.2508	.2461	.1672	.0735	.0165	.0008	.0000
	5	.0000	.0008	.0165	.0735	.1672	.2461	.2508	.1715	.0661	.0074	.0006
	6	.0000	.0001	.0028	.0210	.0743	.1641	.2508	.2668	.1762	.0446	.0077
	7	.0000	.0000	.0003	.0039	.0212	.0703	.1612	.2668	.3020	.1722	.0629
	8	.0000	.0000	.0000	.0004	.0035	.0176	.0605	.1556	.3020	.3874	.2985
	9	.0000	.0000	.0000	.0000	.0003	.0020	.0101	.0404	.1342	.3874	.6302
10	0	.5987	.3487	.1074	.0282	.0060	.0010	.0001	.0000	.0000	.0000	.0000
	1	.3151	.3874	.2684	.1211	.0403	.0098	.0016	.0001	.0000	.0000	.0000
	2	.0746	.1937	.3020	.2335	.1209	.0439	.0106	.0014	.0001	.0000	.0000
	3	.0105	.0574	.2013	.2668	.2150	.1172	.0425	.0090	.0008	.0000	.0000
	4	.0010	.0112	.0881	.2001	.2508	.2051	.1115	.0368	.0055	.0001	.0000
	5	.0001	.0015	.0264	.1029	.2007	.2461	.2007	.1029	.0264	.0015	.0001
	6	.0000	.0001	.0055	.0368	.1115	.2051	.2508	.2001	.0881	.0112	.0010
	7	.0000	.0000	.0008	.0090	.0425	.1172	.2150	.2668	.2013	.0574	.0105
	8	.0000	.0000	.0001	.0014	.0106	.0439	.1209	.2335	.3020	.1937	.0746
	9	.0000	.0000	.0000	.0001	.0016	.0098	.0403	.1211	.2684	.3874	.3151
	10	.0000	.0000	.0000	.0000	.0001	.0010	.0060	.0282	.1074	.3487	.5987
11	0	.5688	.3138	.0859	.0198	.0036	.0005	.0000	.0000	.0000	.0000	.0000
	1	.3293	.3835	.2362	.0932	.0266	.0054	.0007	.0000	.0000	.0000	.0000
	2	.0867	.2131	.2953	.1998	.0887	.0269	.0052	.0005	.0000	.0000	.0000
	3	.0137	.0710	.2215	.2568	.1774	.0806	.0234	.0037	.0002	.0000	.0000
	4	.0014	.0158	.1107	.2201	.2365	.1611	.0701	.0173	.0017	.0000	.0000
	5	.0001	.0025	.0388	.1321	.2207	.2256	.1471	.0566	.0097	.0003	.0000
	6	.0000	.0003	.0097	.0566	.1471	.2256	.2207	.1321	.0388	.0025	.0001
	7	.0000	.0000	.0017	.0173	.0701	.1611	.2365	.2201	.1107	.0158	.0014
	8	.0000	.0000	.0002	.0037	.0234	.0806	.1774	.2568	.2215	.0710	.0137
	9	.0000	.0000	.0000	.0005	.0052	.0269	.0887	.1998	.2953	.2131	.0867

**Table I Table of Binomial Probabilities (continued)**

<i>n</i>	<i>x</i>	<i>p</i>										
		.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
10		.0000	.0000	.0000	.0000	.0007	.0054	.0266	.0932	.2362	.3835	.3293
11		.0000	.0000	.0000	.0000	.0000	.0005	.0036	.0198	.0859	.3138	.5688
12	0	.5404	.2824	.0687	.0138	.0022	.0002	.0000	.0000	.0000	.0000	.0000
	1	.3413	.3766	.2062	.0712	.0174	.0029	.0003	.0000	.0000	.0000	.0000
	2	.0988	.2301	.2835	.1678	.0639	.0161	.0025	.0002	.0000	.0000	.0000
	3	.0173	.0852	.2362	.2397	.1419	.0537	.0125	.0015	.0001	.0000	.0000
	4	.0021	.0213	.1329	.2311	.2128	.1208	.0420	.0078	.0005	.0000	.0000
	5	.0002	.0038	.0532	.1585	.2270	.1934	.1009	.0291	.0033	.0000	.0000
	6	.0000	.0005	.0155	.0792	.1766	.2256	.1766	.0792	.0155	.0005	.0000
	7	.0000	.0000	.0033	.0291	.1009	.1934	.2270	.1585	.0532	.0038	.0002
	8	.0000	.0000	.0005	.0078	.0420	.1208	.2128	.2311	.1329	.0213	.0021
	9	.0000	.0000	.0001	.0015	.0125	.0537	.1419	.2397	.2362	.0852	.0173
10		.0000	.0000	.0000	.0002	.0025	.0161	.0639	.1678	.2835	.2301	.0988
11		.0000	.0000	.0000	.0000	.0003	.0029	.0174	.0712	.2062	.3766	.3413
12		.0000	.0000	.0000	.0000	.0000	.0002	.0022	.0138	.0687	.2824	.5404
13	0	.5133	.2542	.0550	.0097	.0013	.0001	.0000	.0000	.0000	.0000	.0000
	1	.3512	.3672	.1787	.0540	.0113	.0016	.0001	.0000	.0000	.0000	.0000
	2	.1109	.2448	.2680	.1388	.0453	.0095	.0012	.0001	.0000	.0000	.0000
	3	.0214	.0997	.2457	.2181	.1107	.0349	.0065	.0006	.0000	.0000	.0000
	4	.0028	.0277	.1535	.2337	.1845	.0873	.0243	.0034	.0001	.0000	.0000
	5	.0003	.0055	.0691	.1803	.2214	.1571	.0656	.0142	.0011	.0000	.0000
	6	.0000	.0008	.0230	.1030	.1968	.2095	.1312	.0442	.0058	.0001	.0000
	7	.0000	.0001	.0058	.0442	.1312	.2095	.1968	.1030	.0230	.0008	.0000
	8	.0000	.0000	.0011	.0142	.0656	.1571	.2214	.1803	.0691	.0055	.0003
	9	.0000	.0000	.0001	.0034	.0243	.0873	.1845	.2337	.1535	.0277	.0028
10		.0000	.0000	.0000	.0006	.0065	.0349	.1107	.2181	.2457	.0997	.0214
11		.0000	.0000	.0000	.0001	.0012	.0095	.0453	.1388	.2680	.2448	.1109
12		.0000	.0000	.0000	.0000	.0001	.0016	.0113	.0540	.1787	.3672	.3512
13		.0000	.0000	.0000	.0000	.0000	.0001	.0013	.0097	.0550	.2542	.5133
14	0	.4877	.2288	.0440	.0068	.0008	.0001	.0000	.0000	.0000	.0000	.0000
	1	.3593	.3559	.1539	.0407	.0073	.0009	.0001	.0000	.0000	.0000	.0000
	2	.1229	.2570	.2501	.1134	.0317	.0056	.0005	.0000	.0000	.0000	.0000
	3	.0259	.1142	.2501	.1943	.0845	.0222	.0033	.0002	.0000	.0000	.0000
	4	.0037	.0349	.1720	.2290	.1549	.0611	.0136	.0014	.0000	.0000	.0000
	5	.0004	.0078	.0860	.1963	.2066	.1222	.0408	.0066	.0003	.0000	.0000
	6	.0000	.0013	.0322	.1262	.2066	.1833	.0918	.0232	.0020	.0000	.0000
	7	.0000	.0002	.0092	.0618	.1574	.2095	.1574	.0618	.0092	.0002	.0000
	8	.0000	.0000	.0020	.0232	.0918	.1833	.2066	.1262	.0322	.0013	.0000
	9	.0000	.0000	.0003	.0066	.0408	.1222	.2066	.1963	.0860	.0078	.0004
10		.0000	.0000	.0000	.0014	.0136	.0611	.1549	.2290	.1720	.0349	.0037

**Table I Table of Binomial Probabilities (continued)**

<i>n</i>	<i>x</i>	<i>p</i>										
		.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
	11	.0000	.0000	.0000	.0002	.0033	.0222	.0845	.1943	.2501	.1142	.0259
	12	.0000	.0000	.0000	.0000	.0005	.0056	.0317	.1134	.2501	.2570	.1229
	13	.0000	.0000	.0000	.0000	.0001	.0009	.0073	.0407	.1539	.3559	.3593
	14	.0000	.0000	.0000	.0000	.0000	.0001	.0008	.0068	.0440	.2288	.4877
15	0	.4633	.2059	.0352	.0047	.0005	.0000	.0000	.0000	.0000	.0000	.0000
	1	.3658	.3432	.1319	.0305	.0047	.0005	.0000	.0000	.0000	.0000	.0000
	2	.1348	.2669	.2309	.0916	.0219	.0032	.0003	.0000	.0000	.0000	.0000
	3	.0307	.1285	.2501	.1700	.0634	.0139	.0016	.0001	.0000	.0000	.0000
	4	.0049	.0428	.1876	.2186	.1268	.0417	.0074	.0006	.0000	.0000	.0000
	5	.0006	.0105	.1032	.2061	.1859	.0916	.0245	.0030	.0001	.0000	.0000
	6	.0000	.0019	.0430	.1472	.2066	.1527	.0612	.0116	.0007	.0000	.0000
	7	.0000	.0003	.0138	.0811	.1771	.1964	.1181	.0348	.0035	.0000	.0000
	8	.0000	.0000	.0035	.0348	.1181	.1964	.1771	.0811	.0138	.0003	.0000
	9	.0000	.0000	.0007	.0116	.0612	.1527	.2066	.1472	.0430	.0019	.0000
	10	.0000	.0000	.0001	.0030	.0245	.0916	.1859	.2061	.1032	.0105	.0006
	11	.0000	.0000	.0000	.0006	.0074	.0417	.1268	.2186	.1876	.0428	.0049
	12	.0000	.0000	.0000	.0001	.0016	.0139	.0634	.1700	.2501	.1285	.0307
	13	.0000	.0000	.0000	.0000	.0003	.0032	.0219	.0916	.2309	.2669	.1348
	14	.0000	.0000	.0000	.0000	.0000	.0005	.0047	.0305	.1319	.3432	.3658
	15	.0000	.0000	.0000	.0000	.0000	.0000	.0005	.0047	.0352	.2059	.4633
16	0	.4401	.1853	.0281	.0033	.0003	.0000	.0000	.0000	.0000	.0000	.0000
	1	.3706	.3294	.1126	.0228	.0030	.0002	.0000	.0000	.0000	.0000	.0000
	2	.1463	.2745	.2111	.0732	.0150	.0018	.0001	.0000	.0000	.0000	.0000
	3	.0359	.1423	.2463	.1465	.0468	.0085	.0008	.0000	.0000	.0000	.0000
	4	.0061	.0514	.2001	.2040	.1014	.0278	.0040	.0002	.0000	.0000	.0000
	5	.0008	.0137	.1201	.2099	.1623	.0667	.0142	.0013	.0000	.0000	.0000
	6	.0001	.0028	.0550	.1649	.1983	.1222	.0392	.0056	.0002	.0000	.0000
	7	.0000	.0004	.0197	.1010	.1889	.1746	.0840	.0185	.0012	.0000	.0000
	8	.0000	.0001	.0055	.0487	.1417	.1964	.1417	.0487	.0055	.0001	.0000
	9	.0000	.0000	.0012	.0185	.0840	.1746	.1889	.1010	.0197	.0004	.0000
	10	.0000	.0000	.0002	.0056	.0392	.1222	.1983	.1649	.0550	.0028	.0001
	11	.0000	.0000	.0000	.0013	.0142	.0666	.1623	.2099	.1201	.0137	.0008
	12	.0000	.0000	.0000	.0002	.0040	.0278	.1014	.2040	.2001	.0514	.0061
	13	.0000	.0000	.0000	.0000	.0008	.0085	.0468	.1465	.2463	.1423	.0359
	14	.0000	.0000	.0000	.0000	.0001	.0018	.0150	.0732	.2111	.2745	.1463
	15	.0000	.0000	.0000	.0000	.0000	.0002	.0030	.0228	.1126	.3294	.3706
	16	.0000	.0000	.0000	.0000	.0000	.0000	.0003	.0033	.0281	.1853	.4401
17	0	.4181	.1668	.0225	.0023	.0002	.0000	.0000	.0000	.0000	.0000	.0000
	1	.3741	.3150	.0957	.0169	.0019	.0001	.0000	.0000	.0000	.0000	.0000
	2	.1575	.2800	.1914	.0581	.0102	.0010	.0001	.0000	.0000	.0000	.0000

**Table I Table of Binomial Probabilities (continued)**

<i>n</i>	<i>x</i>	<i>p</i>											
		.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95	
3	3	.0415	.1556	.2393	.1245	.0341	.0052	.0004	.0000	.0000	.0000	.0000	
	4	.0076	.0605	.2093	.1868	.0796	.0182	.0021	.0001	.0000	.0000	.0000	
	5	.0010	.0175	.1361	.2081	.1379	.0472	.0081	.0006	.0000	.0000	.0000	
	6	.0001	.0039	.0680	.1784	.1839	.0944	.0242	.0026	.0001	.0000	.0000	
	7	.0000	.0007	.0267	.1201	.1927	.1484	.0571	.0095	.0004	.0000	.0000	
	8	.0000	.0001	.0084	.0644	.1606	.1855	.1070	.0276	.0021	.0000	.0000	
	9	.0000	.0000	.0021	.0276	.1070	.1855	.1606	.0644	.0084	.0001	.0000	
	10	.0000	.0000	.0004	.0095	.0571	.1484	.1927	.1201	.0267	.0007	.0000	
	11	.0000	.0000	.0001	.0026	.0242	.0944	.1839	.1784	.0680	.0039	.0001	
	12	.0000	.0000	.0000	.0006	.0081	.0472	.1379	.2081	.1361	.0175	.0010	
	13	.0000	.0000	.0000	.0001	.0021	.0182	.0796	.1868	.2093	.0605	.0076	
	14	.0000	.0000	.0000	.0000	.0004	.0052	.0341	.1245	.2393	.1556	.0415	
	15	.0000	.0000	.0000	.0000	.0001	.0010	.0102	.0581	.1914	.2800	.1575	
	16	.0000	.0000	.0000	.0000	.0000	.0001	.0019	.0169	.0957	.3150	.3741	
	17	.0000	.0000	.0000	.0000	.0000	.0000	.0002	.0023	.0225	.1668	.4181	
	18	0	.3972	.1501	.0180	.0016	.0001	.0000	.0000	.0000	.0000	.0000	.0000
		1	.3763	.3002	.0811	.0126	.0012	.0001	.0000	.0000	.0000	.0000	.0000
2		.1683	.2835	.1723	.0458	.0069	.0006	.0000	.0000	.0000	.0000	.0000	
3		.0473	.1680	.2297	.1046	.0246	.0031	.0002	.0000	.0000	.0000	.0000	
4		.0093	.0700	.2153	.1681	.0614	.0117	.0011	.0000	.0000	.0000	.0000	
5		.0014	.0218	.1507	.2017	.1146	.0327	.0045	.0002	.0000	.0000	.0000	
6		.0002	.0052	.0816	.1873	.1655	.0708	.0145	.0012	.0000	.0000	.0000	
7		.0000	.0010	.0350	.1376	.1892	.1214	.0374	.0046	.0001	.0000	.0000	
8		.0000	.0002	.0120	.0811	.1734	.1669	.0771	.0149	.0008	.0000	.0000	
9		.0000	.0000	.0033	.0386	.1284	.1855	.1284	.0386	.0033	.0000	.0000	
10		.0000	.0000	.0008	.0149	.0771	.1669	.1734	.0811	.0120	.0002	.0000	
11		.0000	.0000	.0001	.0046	.0374	.1214	.1892	.1376	.0350	.0010	.0000	
12		.0000	.0000	.0000	.0012	.0145	.0708	.1655	.1873	.0816	.0052	.0002	
13		.0000	.0000	.0000	.0002	.0045	.0327	.1146	.2017	.1507	.0218	.0014	
14		.0000	.0000	.0000	.0000	.0011	.0117	.0614	.1681	.2153	.0700	.0093	
15		.0000	.0000	.0000	.0000	.0002	.0031	.0246	.1046	.2297	.1680	.0473	
16		.0000	.0000	.0000	.0000	.0000	.0006	.0069	.0458	.1723	.2835	.1683	
17		.0000	.0000	.0000	.0000	.0000	.0001	.0012	.0126	.0811	.3002	.3763	
18	.0000	.0000	.0000	.0000	.0000	.0000	.0001	.0016	.0180	.1501	.3972		
19	0	.3774	.1351	.0144	.0011	.0001	.0000	.0000	.0000	.0000	.0000	.0000	
	1	.3774	.2852	.0685	.0093	.0008	.0000	.0000	.0000	.0000	.0000	.0000	
	2	.1787	.2852	.1540	.0358	.0046	.0003	.0000	.0000	.0000	.0000	.0000	
	3	.0533	.1796	.2182	.0869	.0175	.0018	.0001	.0000	.0000	.0000	.0000	
	4	.0112	.0798	.2182	.1491	.0467	.0074	.0005	.0000	.0000	.0000	.0000	

Table I Table of Binomial Probabilities (continued)

<i>n</i>	<i>x</i>	<i>p</i>										
		.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
	5	.0018	.0266	.1636	.1916	.0933	.0222	.0024	.0001	.0000	.0000	.0000
	6	.0002	.0069	.0955	.1916	.1451	.0518	.0085	.0005	.0000	.0000	.0000
	7	.0000	.0014	.0443	.1525	.1797	.0961	.0237	.0022	.0000	.0000	.0000
	8	.0000	.0002	.0166	.0981	.1797	.1442	.0532	.0077	.0003	.0000	.0000
	9	.0000	.0000	.0051	.0514	.1464	.1762	.0976	.0220	.0013	.0000	.0000
	10	.0000	.0000	.0013	.0220	.0976	.1762	.1464	.0514	.0051	.0000	.0000
	11	.0000	.0000	.0003	.0077	.0532	.1442	.1797	.0981	.0166	.0002	.0000
	12	.0000	.0000	.0000	.0022	.0237	.0961	.1797	.1525	.0443	.0014	.0000
	13	.0000	.0000	.0000	.0005	.0085	.0518	.1451	.1916	.0955	.0069	.0002
	14	.0000	.0000	.0000	.0001	.0024	.0222	.0933	.1916	.1636	.0266	.0018
	15	.0000	.0000	.0000	.0000	.0005	.0074	.0467	.1491	.2182	.0798	.0112
	16	.0000	.0000	.0000	.0000	.0001	.0018	.0175	.0869	.2182	.1796	.0533
	17	.0000	.0000	.0000	.0000	.0000	.0003	.0046	.0358	.1540	.2852	.1787
	18	.0000	.0000	.0000	.0000	.0000	.0000	.0008	.0093	.0685	.2852	.3774
	19	.0000	.0000	.0000	.0000	.0000	.0000	.0001	.0011	.0144	.1351	.3774
20	0	.3585	.1216	.0115	.0008	.0000	.0000	.0000	.0000	.0000	.0000	.0000
	1	.3774	.2702	.0576	.0068	.0005	.0000	.0000	.0000	.0000	.0000	.0000
	2	.1887	.2852	.1369	.0278	.0031	.0002	.0000	.0000	.0000	.0000	.0000
	3	.0596	.1901	.2054	.0716	.0123	.0011	.0000	.0000	.0000	.0000	.0000
	4	.0133	.0898	.2182	.1304	.0350	.0046	.0003	.0000	.0000	.0000	.0000
	5	.0022	.0319	.1746	.1789	.0746	.0148	.0013	.0000	.0000	.0000	.0000
	6	.0003	.0089	.1091	.1916	.1244	.0370	.0049	.0002	.0000	.0000	.0000
	7	.0000	.0020	.0545	.1643	.1659	.0739	.0146	.0010	.0000	.0000	.0000
	8	.0000	.0004	.0222	.1144	.1797	.1201	.0355	.0039	.0001	.0000	.0000
	9	.0000	.0001	.0074	.0654	.1597	.1602	.0710	.0120	.0005	.0000	.0000
	10	.0000	.0000	.0020	.0308	.1171	.1762	.1171	.0308	.0020	.0000	.0000
	11	.0000	.0000	.0005	.0120	.0710	.1602	.1597	.0654	.0074	.0001	.0000
	12	.0000	.0000	.0001	.0039	.0355	.1201	.1797	.1144	.0222	.0004	.0000
	13	.0000	.0000	.0000	.0010	.0146	.0739	.1659	.1643	.0545	.0020	.0000
	14	.0000	.0000	.0000	.0002	.0049	.0370	.1244	.1916	.1091	.0089	.0003
	15	.0000	.0000	.0000	.0000	.0013	.0148	.0746	.1789	.1746	.0319	.0022
	16	.0000	.0000	.0000	.0000	.0003	.0046	.0350	.1304	.2182	.0898	.0133
	17	.0000	.0000	.0000	.0000	.0000	.0011	.0123	.0716	.2054	.1901	.0596
	18	.0000	.0000	.0000	.0000	.0000	.0002	.0031	.0278	.1369	.2852	.1887
	19	.0000	.0000	.0000	.0000	.0000	.0000	.0005	.0068	.0576	.2702	.3774
	20	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0008	.0115	.1216	.3585
21	0	.3406	.1094	.0092	.0006	.0000	.0000	.0000	.0000	.0000	.0000	.0000
	1	.3764	.2553	.0484	.0050	.0003	.0000	.0000	.0000	.0000	.0000	.0000
	2	.1981	.2837	.1211	.0215	.0020	.0001	.0000	.0000	.0000	.0000	.0000

**Table I Table of Binomial Probabilities (continued)**

<i>n</i>	<i>x</i>	<i>p</i>										
		.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
	3	.0660	.1996	.1917	.0585	.0086	.0006	.0000	.0000	.0000	.0000	.0000
	4	.0156	.0998	.2156	.1128	.0259	.0029	.0001	.0000	.0000	.0000	.0000
	5	.0028	.0377	.1833	.1643	.0588	.0097	.0007	.0000	.0000	.0000	.0000
	6	.0004	.0112	.1222	.1878	.1045	.0259	.0027	.0001	.0000	.0000	.0000
	7	.0000	.0027	.0655	.1725	.1493	.0554	.0087	.0005	.0000	.0000	.0000
	8	.0000	.0005	.0286	.1294	.1742	.0970	.0229	.0019	.0000	.0000	.0000
	9	.0000	.0001	.0103	.0801	.1677	.1402	.0497	.0063	.0002	.0000	.0000
	10	.0000	.0000	.0031	.0412	.1342	.1682	.0895	.0176	.0008	.0000	.0000
	11	.0000	.0000	.0008	.0176	.0895	.1682	.1342	.0412	.0031	.0000	.0000
	12	.0000	.0000	.0002	.0063	.0497	.1402	.1677	.0801	.0103	.0001	.0000
	13	.0000	.0000	.0000	.0019	.0229	.0970	.1742	.1294	.0286	.0005	.0000
	14	.0000	.0000	.0000	.0005	.0087	.0554	.1493	.1725	.0655	.0027	.0000
	15	.0000	.0000	.0000	.0001	.0027	.0259	.1045	.1878	.1222	.0112	.0004
	16	.0000	.0000	.0000	.0000	.0007	.0097	.0588	.1643	.1833	.0377	.0028
	17	.0000	.0000	.0000	.0000	.0001	.0029	.0259	.1128	.2156	.0998	.0156
	18	.0000	.0000	.0000	.0000	.0000	.0006	.0086	.0585	.1917	.1996	.0660
	19	.0000	.0000	.0000	.0000	.0000	.0001	.0020	.0215	.1211	.2837	.1981
	20	.0000	.0000	.0000	.0000	.0000	.0000	.0003	.0050	.0484	.2553	.3764
	21	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0006	.0092	.1094	.3406
22	0	.3235	.0985	.0074	.0004	.0000	.0000	.0000	.0000	.0000	.0000	.0000
	1	.3746	.2407	.0406	.0037	.0002	.0000	.0000	.0000	.0000	.0000	.0000
	2	.2070	.2808	.1065	.0166	.0014	.0001	.0000	.0000	.0000	.0000	.0000
	3	.0726	.2080	.1775	.0474	.0060	.0004	.0000	.0000	.0000	.0000	.0000
	4	.0182	.1098	.2108	.0965	.0190	.0017	.0001	.0000	.0000	.0000	.0000
	5	.0034	.0439	.1898	.1489	.0456	.0063	.0004	.0000	.0000	.0000	.0000
	6	.0005	.0138	.1344	.1808	.0862	.0178	.0015	.0000	.0000	.0000	.0000
	7	.0001	.0035	.0768	.1771	.1314	.0407	.0051	.0002	.0000	.0000	.0000
	8	.0000	.0007	.0360	.1423	.1642	.0762	.0144	.0009	.0000	.0000	.0000
	9	.0000	.0001	.0140	.0949	.1703	.1186	.0336	.0032	.0001	.0000	.0000
	10	.0000	.0000	.0046	.0529	.1476	.1542	.0656	.0097	.0003	.0000	.0000
	11	.0000	.0000	.0012	.0247	.1073	.1682	.1073	.0247	.0012	.0000	.0000
	12	.0000	.0000	.0003	.0097	.0656	.1542	.1476	.0529	.0046	.0000	.0000
	13	.0000	.0000	.0001	.0032	.0336	.1186	.1703	.0949	.0140	.0001	.0000
	14	.0000	.0000	.0000	.0009	.0144	.0762	.1642	.1423	.0360	.0007	.0000
	15	.0000	.0000	.0000	.0002	.0051	.0407	.1314	.1771	.0768	.0035	.0001
	16	.0000	.0000	.0000	.0000	.0015	.0178	.0862	.1808	.1344	.0138	.0005
	17	.0000	.0000	.0000	.0000	.0004	.0063	.0456	.1489	.1898	.0439	.0034
	18	.0000	.0000	.0000	.0000	.0001	.0017	.0190	.0965	.2108	.1098	.0182
	19	.0000	.0000	.0000	.0000	.0000	.0004	.0060	.0474	.1775	.2080	.0726

**Table I Table of Binomial Probabilities (continued)**

<i>n</i>	<i>x</i>	<i>p</i>										
		.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
	20	.0000	.0000	.0000	.0000	.0000	.0001	.0014	.0166	.1065	.2808	.2070
	21	.0000	.0000	.0000	.0000	.0000	.0000	.0002	.0037	.0406	.2407	.3746
	22	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0004	.0074	.0985	.3235
23	0	.3074	.0886	.0059	.0003	.0000	.0000	.0000	.0000	.0000	.0000	.0000
	1	.3721	.2265	.0339	.0027	.0001	.0000	.0000	.0000	.0000	.0000	.0000
	2	.2154	.2768	.0933	.0127	.0009	.0000	.0000	.0000	.0000	.0000	.0000
	3	.0794	.2153	.1633	.0382	.0041	.0002	.0000	.0000	.0000	.0000	.0000
	4	.0209	.1196	.2042	.0818	.0138	.0011	.0000	.0000	.0000	.0000	.0000
	5	.0042	.0505	.1940	.1332	.0350	.0040	.0002	.0000	.0000	.0000	.0000
	6	.0007	.0168	.1455	.1712	.0700	.0120	.0008	.0000	.0000	.0000	.0000
	7	.0001	.0045	.0883	.1782	.1133	.0292	.0029	.0001	.0000	.0000	.0000
	8	.0000	.0010	.0442	.1527	.1511	.0584	.0088	.0004	.0000	.0000	.0000
	9	.0000	.0002	.0184	.1091	.1679	.0974	.0221	.0016	.0000	.0000	.0000
	10	.0000	.0000	.0064	.0655	.1567	.1364	.0464	.0052	.0001	.0000	.0000
	11	.0000	.0000	.0019	.0332	.1234	.1612	.0823	.0142	.0005	.0000	.0000
	12	.0000	.0000	.0005	.0142	.0823	.1612	.1234	.0332	.0019	.0000	.0000
	13	.0000	.0000	.0001	.0052	.0464	.1364	.1567	.0655	.0064	.0000	.0000
	14	.0000	.0000	.0000	.0016	.0221	.0974	.1679	.1091	.0184	.0002	.0000
	15	.0000	.0000	.0000	.0004	.0088	.0584	.1511	.1527	.0442	.0010	.0000
	16	.0000	.0000	.0000	.0001	.0029	.0292	.1133	.1782	.0883	.0045	.0001
	17	.0000	.0000	.0000	.0000	.0008	.0120	.0700	.1712	.1455	.0168	.0007
	18	.0000	.0000	.0000	.0000	.0002	.0040	.0350	.1332	.1940	.0505	.0042
	19	.0000	.0000	.0000	.0000	.0000	.0011	.0138	.0818	.2042	.1196	.0209
	20	.0000	.0000	.0000	.0000	.0000	.0002	.0041	.0382	.1633	.2153	.0794
	21	.0000	.0000	.0000	.0000	.0000	.0000	.0009	.0127	.0933	.2768	.2154
	22	.0000	.0000	.0000	.0000	.0000	.0000	.0001	.0027	.0339	.2265	.3721
	23	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0003	.0059	.0886	.3074
24	0	.2920	.0798	.0047	.0002	.0000	.0000	.0000	.0000	.0000	.0000	.0000
	1	.3688	.2127	.0283	.0020	.0001	.0000	.0000	.0000	.0000	.0000	.0000
	2	.2232	.2718	.0815	.0097	.0006	.0000	.0000	.0000	.0000	.0000	.0000
	3	.0862	.2215	.1493	.0305	.0028	.0001	.0000	.0000	.0000	.0000	.0000
	4	.0238	.1292	.1960	.0687	.0099	.0006	.0000	.0000	.0000	.0000	.0000
	5	.0050	.0574	.1960	.1177	.0265	.0025	.0001	.0000	.0000	.0000	.0000
	6	.0008	.0202	.1552	.1598	.0560	.0080	.0004	.0000	.0000	.0000	.0000
	7	.0001	.0058	.0998	.1761	.0960	.0206	.0017	.0000	.0000	.0000	.0000
	8	.0000	.0014	.0530	.1604	.1360	.0438	.0053	.0002	.0000	.0000	.0000
	9	.0000	.0003	.0236	.1222	.1612	.0779	.0141	.0008	.0000	.0000	.0000
	10	.0000	.0000	.0088	.0785	.1612	.1169	.0318	.0026	.0000	.0000	.0000
	11	.0000	.0000	.0028	.0428	.1367	.1488	.0608	.0079	.0002	.0000	.0000

**Table I Table of Binomial Probabilities (continued)**

<i>n</i>	<i>x</i>	<i>p</i>										
		.05	.10	.20	.30	.40	.50	.60	.70	.80	.90	.95
12		.0000	.0000	.0008	.0199	.0988	.1612	.0988	.0199	.0008	.0000	.0000
13		.0000	.0000	.0002	.0079	.0608	.1488	.1367	.0428	.0028	.0000	.0000
14		.0000	.0000	.0000	.0026	.0318	.1169	.1612	.0785	.0088	.0000	.0000
15		.0000	.0000	.0000	.0008	.0141	.0779	.1612	.1222	.0236	.0003	.0000
16		.0000	.0000	.0000	.0002	.0053	.0438	.1360	.1604	.0530	.0014	.0000
17		.0000	.0000	.0000	.0000	.0017	.0206	.0960	.1761	.0998	.0058	.0001
18		.0000	.0000	.0000	.0000	.0004	.0080	.0560	.1598	.1552	.0202	.0008
19		.0000	.0000	.0000	.0000	.0001	.0025	.0265	.1177	.1960	.0574	.0050
20		.0000	.0000	.0000	.0000	.0000	.0006	.0099	.0687	.1960	.1292	.0238
21		.0000	.0000	.0000	.0000	.0000	.0001	.0028	.0305	.1493	.2215	.0862
22		.0000	.0000	.0000	.0000	.0000	.0000	.0006	.0097	.0815	.2718	.2232
23		.0000	.0000	.0000	.0000	.0000	.0000	.0001	.0020	.0283	.2127	.3688
24		.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0002	.0047	.0798	.2920
25	0	.2774	.0718	.0038	.0001	.0000	.0000	.0000	.0000	.0000	.0000	.0000
	1	.3650	.1994	.0236	.0014	.0000	.0000	.0000	.0000	.0000	.0000	.0000
	2	.2305	.2659	.0708	.0074	.0004	.0000	.0000	.0000	.0000	.0000	.0000
	3	.0930	.2265	.1358	.0243	.0019	.0001	.0000	.0000	.0000	.0000	.0000
	4	.0269	.1384	.1867	.0572	.0071	.0004	.0000	.0000	.0000	.0000	.0000
	5	.0060	.0646	.1960	.1030	.0199	.0016	.0000	.0000	.0000	.0000	.0000
	6	.0010	.0239	.1633	.1472	.0442	.0053	.0002	.0000	.0000	.0000	.0000
	7	.0001	.0072	.1108	.1712	.0800	.0143	.0009	.0000	.0000	.0000	.0000
	8	.0000	.0018	.0623	.1651	.1200	.0322	.0031	.0001	.0000	.0000	.0000
	9	.0000	.0004	.0294	.1336	.1511	.0609	.0088	.0004	.0000	.0000	.0000
	10	.0000	.0001	.0118	.0916	.1612	.0974	.0212	.0013	.0000	.0000	.0000
	11	.0000	.0000	.0040	.0536	.1465	.1328	.0434	.0042	.0001	.0000	.0000
	12	.0000	.0000	.0012	.0268	.1140	.1550	.0760	.0115	.0003	.0000	.0000
	13	.0000	.0000	.0003	.0115	.0760	.1550	.1140	.0268	.0012	.0000	.0000
	14	.0000	.0000	.0001	.0042	.0434	.1328	.1465	.0536	.0040	.0000	.0000
	15	.0000	.0000	.0000	.0013	.0212	.0974	.1612	.0916	.0118	.0001	.0000
	16	.0000	.0000	.0000	.0004	.0088	.0609	.1511	.1336	.0294	.0004	.0000
	17	.0000	.0000	.0000	.0001	.0031	.0322	.1200	.1651	.0623	.0018	.0000
	18	.0000	.0000	.0000	.0000	.0009	.0143	.0800	.1712	.1108	.0072	.0001
	19	.0000	.0000	.0000	.0000	.0002	.0053	.0442	.1472	.1633	.0239	.0010
	20	.0000	.0000	.0000	.0000	.0000	.0016	.0199	.1030	.1960	.0646	.0060
	21	.0000	.0000	.0000	.0000	.0000	.0004	.0071	.0572	.1867	.1384	.0269
	22	.0000	.0000	.0000	.0000	.0000	.0001	.0019	.0243	.1358	.2265	.0930
	23	.0000	.0000	.0000	.0000	.0000	.0000	.0004	.0074	.0708	.2659	.2305
	24	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0014	.0236	.1994	.3650
	25	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0001	.0038	.0718	.2774

**Table II** Values of  $e^{-\lambda}$ 

$\lambda$	$e^{-\lambda}$	$\lambda$	$e^{-\lambda}$
0.0	1.00000000	3.9	.02024191
0.1	.90483742	4.0	.01831564
0.2	.81873075	4.1	.01657268
0.3	.74081822	4.2	.01499558
0.4	.67032005	4.3	.01356856
0.5	.60653066	4.4	.01227734
0.6	.54881164	4.5	.01110900
0.7	.49658530	4.6	.01005184
0.8	.44932896	4.7	.00909528
0.9	.40656966	4.8	.00822975
1.0	.36787944	4.9	.00744658
1.1	.33287108	5.0	.00673795
1.2	.30119421	5.1	.00609675
1.3	.27253179	5.2	.00551656
1.4	.24659696	5.3	.00499159
1.5	.22313016	5.4	.00451658
1.6	.20189652	5.5	.00408677
1.7	.18268352	5.6	.00369786
1.8	.16529889	5.7	.00334597
1.9	.14956862	5.8	.00302755
2.0	.13533528	5.9	.00273944
2.1	.12245643	6.0	.00247875
2.2	.11080316	6.1	.00224287
2.3	.10025884	6.2	.00202943
2.4	.09071795	6.3	.00183630
2.5	.08208500	6.4	.00166156
2.6	.07427358	6.5	.00150344
2.7	.06720551	6.6	.00136037
2.8	.06081006	6.7	.00123091
2.9	.05502322	6.8	.00111378
3.0	.04978707	6.9	.00100779
3.1	.04504920	7.0	.00091188
3.2	.04076220	7.1	.00082510
3.3	.03688317	7.2	.00074659
3.4	.03337327	7.3	.00067554
3.5	.03019738	7.4	.00061125
3.6	.02732372	7.5	.00055308
3.7	.02472353	7.6	.00050045
3.8	.02237077	7.7	.00045283

**Table II** Values of  $e^{-\lambda}$  (continued)

$\lambda$	$e^{-\lambda}$	$\lambda$	$e^{-\lambda}$
7.8	.00040973	9.5	.00007485
7.9	.00037074	9.6	.00006773
8.0	.00033546	9.7	.00006128
8.1	.00030354	9.8	.00005545
8.2	.00027465	9.9	.00005017
8.3	.00024852	10.0	.00004540
8.4	.00022487	11.0	.00001670
8.5	.00020347	12.0	.00000614
8.6	.00018411	13.0	.00000226
8.7	.00016659	14.0	.00000083
8.8	.00015073	15.0	.00000031
8.9	.00013639	16.0	.00000011
9.0	.00012341	17.0	.00000004
9.1	.00011167	18.0	.000000015
9.2	.00010104	19.0	.000000006
9.3	.00009142	20.0	.000000002
9.4	.00008272		



**Table III Table of Poisson Probabilities (continued)**

<i>x</i>	$\lambda$									
	3.1	3.2	3.3	3.4	3.5	3.6	3.7	3.8	3.9	4.0
0	.0450	.0408	.0369	.0334	.0302	.0273	.0247	.0224	.0202	.0183
1	.1397	.1304	.1217	.1135	.1057	.0984	.0915	.0850	.0789	.0733
2	.2165	.2087	.2008	.1929	.1850	.1771	.1692	.1615	.1539	.1465
3	.2237	.2226	.2209	.2186	.2158	.2125	.2087	.2046	.2001	.1954
4	.1733	.1781	.1823	.1858	.1888	.1912	.1931	.1944	.1951	.1954
5	.1075	.1140	.1203	.1264	.1322	.1377	.1429	.1477	.1522	.1563
6	.0555	.0608	.0662	.0716	.0771	.0826	.0881	.0936	.0989	.1042
7	.0246	.0278	.0312	.0348	.0385	.0425	.0466	.0508	.0551	.0595
8	.0095	.0111	.0129	.0148	.0169	.0191	.0215	.0241	.0269	.0298
9	.0033	.0040	.0047	.0056	.0066	.0076	.0089	.0102	.0116	.0132
10	.0010	.0013	.0016	.0019	.0023	.0028	.0033	.0039	.0045	.0053
11	.0003	.0004	.0005	.0006	.0007	.0009	.0011	.0013	.0016	.0019
12	.0001	.0001	.0001	.0002	.0002	.0003	.0003	.0004	.0005	.0006
13	.0000	.0000	.0000	.0000	.0001	.0001	.0001	.0001	.0002	.0002
14	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0001

<i>x</i>	$\lambda$									
	4.1	4.2	4.3	4.4	4.5	4.6	4.7	4.8	4.9	5.0
0	.0166	.0150	.0136	.0123	.0111	.0101	.0091	.0082	.0074	.0067
1	.0679	.0630	.0583	.0540	.0500	.0462	.0427	.0395	.0365	.0337
2	.1393	.1323	.1254	.1188	.1125	.1063	.1005	.0948	.0894	.0842
3	.1904	.1852	.1798	.1743	.1687	.1631	.1574	.1517	.1460	.1404
4	.1951	.1944	.1933	.1917	.1898	.1875	.1849	.1820	.1789	.1755
5	.1600	.1633	.1662	.1687	.1708	.1725	.1738	.1747	.1753	.1755
6	.1093	.1143	.1191	.1237	.1281	.1323	.1362	.1398	.1432	.1462
7	.0640	.0686	.0732	.0778	.0824	.0869	.0914	.0959	.1002	.1044
8	.0328	.0360	.0393	.0428	.0463	.0500	.0537	.0575	.0614	.0653
9	.0150	.0168	.0188	.0209	.0232	.0255	.0281	.0307	.0334	.0363
10	.0061	.0071	.0081	.0092	.0104	.0118	.0132	.0147	.0164	.0181
11	.0023	.0027	.0032	.0037	.0043	.0049	.0056	.0064	.0073	.0082
12	.0008	.0009	.0011	.0014	.0016	.0019	.0022	.0026	.0030	.0034
13	.0002	.0003	.0004	.0005	.0006	.0007	.0008	.0009	.0011	.0013
14	.0001	.0001	.0001	.0001	.0002	.0002	.0003	.0003	.0004	.0005
15	.0000	.0000	.0000	.0000	.0001	.0001	.0001	.0001	.0001	.0002

<i>x</i>	$\lambda$									
	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6.0
0	.0061	.0055	.0050	.0045	.0041	.0037	.0033	.0030	.0027	.0025
1	.0311	.0287	.0265	.0244	.0225	.0207	.0191	.0176	.0162	.0149

**Table III Table of Poisson Probabilities (continued)**

<i>x</i>	$\lambda$									
	5.1	5.2	5.3	5.4	5.5	5.6	5.7	5.8	5.9	6.0
2	.0793	.0746	.0701	.0659	.0618	.0580	.0544	.0509	.0477	.0446
3	.1348	.1293	.1239	.1185	.1133	.1082	.1033	.0985	.0938	.0892
4	.1719	.1681	.1641	.1600	.1558	.1515	.1472	.1428	.1383	.1339
5	.1753	.1748	.1740	.1728	.1714	.1697	.1678	.1656	.1632	.1606
6	.1490	.1515	.1537	.1555	.1571	.1584	.1594	.1601	.1605	.1606
7	.1086	.1125	.1163	.1200	.1234	.1267	.1298	.1326	.1353	.1377
8	.0692	.0731	.0771	.0810	.0849	.0887	.0925	.0962	.0998	.1033
9	.0392	.0423	.0454	.0486	.0519	.0552	.0586	.0620	.0654	.0688
10	.0200	.0220	.0241	.0262	.0285	.0309	.0334	.0359	.0386	.0413
11	.0093	.0104	.0116	.0129	.0143	.0157	.0173	.0190	.0207	.0225
12	.0039	.0045	.0051	.0058	.0065	.0073	.0082	.0092	.0102	.0113
13	.0015	.0018	.0021	.0024	.0028	.0032	.0036	.0041	.0046	.0052
14	.0006	.0007	.0008	.0009	.0011	.0013	.0015	.0017	.0019	.0022
15	.0002	.0002	.0003	.0003	.0004	.0005	.0006	.0007	.0008	.0009
16	.0001	.0001	.0001	.0001	.0001	.0002	.0002	.0002	.0003	.0003
17	.0000	.0000	.0000	.0000	.0000	.0001	.0001	.0001	.0001	.0001

<i>x</i>	$\lambda$									
	6.1	6.2	6.3	6.4	6.5	6.6	6.7	6.8	6.9	7.0
0	.0022	.0020	.0018	.0017	.0015	.0014	.0012	.0011	.0010	.0009
1	.0137	.0126	.0116	.0106	.0098	.0090	.0082	.0076	.0070	.0064
2	.0417	.0390	.0364	.0340	.0318	.0296	.0276	.0258	.0240	.0223
3	.0848	.0806	.0765	.0726	.0688	.0652	.0617	.0584	.0552	.0521
4	.1294	.1249	.1205	.1162	.1118	.1076	.1034	.0992	.0952	.0912
5	.1579	.1549	.1519	.1487	.1454	.1420	.1385	.1349	.1314	.1277
6	.1605	.1601	.1595	.1586	.1575	.1562	.1546	.1529	.1511	.1490
7	.1399	.1418	.1435	.1450	.1462	.1472	.1480	.1486	.1489	.1490
8	.1066	.1099	.1130	.1160	.1188	.1215	.1240	.1263	.1284	.1304
9	.0723	.0757	.0791	.0825	.0858	.0891	.0923	.0954	.0985	.1014
10	.0441	.0469	.0498	.0528	.0558	.0588	.0618	.0649	.0679	.0710
11	.0244	.0265	.0285	.0307	.0330	.0353	.0377	.0401	.0426	.0452
12	.0124	.0137	.0150	.0164	.0179	.0194	.0210	.0227	.0245	.0263
13	.0058	.0065	.0073	.0081	.0089	.0099	.0108	.0119	.0130	.0142
14	.0025	.0029	.0033	.0037	.0041	.0046	.0052	.0058	.0064	.0071
15	.0010	.0012	.0014	.0016	.0018	.0020	.0023	.0026	.0029	.0033
16	.0004	.0005	.0005	.0006	.0007	.0008	.0010	.0011	.0013	.0014
17	.0001	.0002	.0002	.0002	.0003	.0003	.0004	.0004	.0005	.0006
18	.0000	.0001	.0001	.0001	.0001	.0001	.0001	.0002	.0002	.0002
19	.0000	.0000	.0000	.0000	.0000	.0000	.0001	.0001	.0001	.0001

**Table III Table of Poisson Probabilities (continued)**

<i>x</i>	$\lambda$									
	7.1	7.2	7.3	7.4	7.5	7.6	7.7	7.8	7.9	8.0
0	.0008	.0007	.0007	.0006	.0006	.0005	.0005	.0004	.0004	.0003
1	.0059	.0054	.0049	.0045	.0041	.0038	.0035	.0032	.0029	.0027
2	.0208	.0194	.0180	.0167	.0156	.0145	.0134	.0125	.0116	.0107
3	.0492	.0464	.0438	.0413	.0389	.0366	.0345	.0324	.0305	.0286
4	.0874	.0836	.0799	.0764	.0729	.0696	.0663	.0632	.0602	.0573
5	.1241	.1204	.1167	.1130	.1094	.1057	.1021	.0986	.0951	.0916
6	.1468	.1445	.1420	.1394	.1367	.1339	.1311	.1282	.1252	.1221
7	.1489	.1486	.1481	.1474	.1465	.1454	.1442	.1428	.1413	.1396
8	.1321	.1337	.1351	.1363	.1373	.1381	.1388	.1392	.1395	.1396
9	.1042	.1070	.1096	.1121	.1144	.1167	.1187	.1207	.1224	.1241
10	.0740	.0770	.0800	.0829	.0858	.0887	.0914	.0941	.0967	.0993
11	.0478	.0504	.0531	.0558	.0585	.0613	.0640	.0667	.0695	.0722
12	.0283	.0303	.0323	.0344	.0366	.0388	.0411	.0434	.0457	.0481
13	.0154	.0168	.0181	.0196	.0211	.0227	.0243	.0260	.0278	.0296
14	.0078	.0086	.0095	.0104	.0113	.0123	.0134	.0145	.0157	.0169
15	.0037	.0041	.0046	.0051	.0057	.0062	.0069	.0075	.0083	.0090
16	.0016	.0019	.0021	.0024	.0026	.0030	.0033	.0037	.0041	.0045
17	.0007	.0008	.0009	.0010	.0012	.0013	.0015	.0017	.0019	.0021
18	.0003	.0003	.0004	.0004	.0005	.0006	.0006	.0007	.0008	.0009
19	.0001	.0001	.0001	.0002	.0002	.0002	.0003	.0003	.0003	.0004
20	.0000	.0000	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0002
21	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0001	.0001

<i>x</i>	$\lambda$									
	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	9.0
0	.0003	.0003	.0002	.0002	.0002	.0002	.0002	.0002	.0001	.0001
1	.0025	.0023	.0021	.0019	.0017	.0016	.0014	.0013	.0012	.0011
2	.0100	.0092	.0086	.0079	.0074	.0068	.0063	.0058	.0054	.0050
3	.0269	.0252	.0237	.0222	.0208	.0195	.0183	.0171	.0160	.0150
4	.0544	.0517	.0491	.0466	.0443	.0420	.0398	.0377	.0357	.0337
5	.0882	.0849	.0816	.0784	.0752	.0722	.0692	.0663	.0635	.0607
6	.1191	.1160	.1128	.1097	.1066	.1034	.1003	.0972	.0941	.0911
7	.1378	.1358	.1338	.1317	.1294	.1271	.1247	.1222	.1197	.1171
8	.1395	.1392	.1388	.1382	.1375	.1366	.1356	.1344	.1332	.1318
9	.1255	.1269	.1280	.1290	.1299	.1306	.1311	.1315	.1317	.1318
10	.1017	.1040	.1063	.1084	.1104	.1123	.1140	.1157	.1172	.1186
11	.0749	.0775	.0802	.0828	.0853	.0878	.0902	.0925	.0948	.0970
12	.0505	.0530	.0555	.0579	.0604	.0629	.0654	.0679	.0703	.0728

**Table III Table of Poisson Probabilities (continued)**

<i>x</i>	$\lambda$									
	8.1	8.2	8.3	8.4	8.5	8.6	8.7	8.8	8.9	9.0
13	.0315	.0334	.0354	.0374	.0395	.0416	.0438	.0459	.0481	.0504
14	.0182	.0196	.0210	.0225	.0240	.0256	.0272	.0289	.0306	.0324
15	.0098	.0107	.0116	.0126	.0136	.0147	.0158	.0169	.0182	.0194
16	.0050	.0055	.0060	.0066	.0072	.0079	.0086	.0093	.0101	.0109
17	.0024	.0026	.0029	.0033	.0036	.0040	.0044	.0048	.0053	.0058
18	.0011	.0012	.0014	.0015	.0017	.0019	.0021	.0024	.0026	.0029
19	.0005	.0005	.0006	.0007	.0008	.0009	.0010	.0011	.0012	.0014
20	.0002	.0002	.0002	.0003	.0003	.0004	.0004	.0005	.0005	.0006
21	.0001	.0001	.0001	.0001	.0001	.0002	.0002	.0002	.0002	.0003
22	.0000	.0000	.0000	.0000	.0001	.0001	.0001	.0001	.0001	.0001

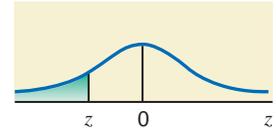
  

<i>x</i>	$\lambda$									
	9.1	9.2	9.3	9.4	9.5	9.6	9.7	9.8	9.9	10
0	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0000
1	.0010	.0009	.0009	.0008	.0007	.0007	.0006	.0005	.0005	.0005
2	.0046	.0043	.0040	.0037	.0034	.0031	.0029	.0027	.0025	.0023
3	.0140	.0131	.0123	.0115	.0107	.0100	.0093	.0087	.0081	.0076
4	.0319	.0302	.0285	.0269	.0254	.0240	.0226	.0213	.0201	.0189
5	.0581	.0555	.0530	.0506	.0483	.0460	.0439	.0418	.0398	.0378
6	.0881	.0851	.0822	.0793	.0764	.0736	.0709	.0682	.0656	.0631
7	.1145	.1118	.1091	.1064	.1037	.1010	.0982	.0955	.0928	.0901
8	.1302	.1286	.1269	.1251	.1232	.1212	.1191	.1170	.1148	.1126
9	.1317	.1315	.1311	.1306	.1300	.1293	.1284	.1274	.1263	.1251
10	.1198	.1209	.1219	.1228	.1235	.1241	.1245	.1249	.1250	.1251
11	.0991	.1012	.1031	.1049	.1067	.1083	.1098	.1112	.1125	.1137
12	.0752	.0776	.0799	.0822	.0844	.0866	.0888	.0908	.0928	.0948
13	.0526	.0549	.0572	.0594	.0617	.0640	.0662	.0685	.0707	.0729
14	.0342	.0361	.0380	.0399	.0419	.0439	.0459	.0479	.0500	.0521
15	.0208	.0221	.0235	.0250	.0265	.0281	.0297	.0313	.0330	.0347
16	.0118	.0127	.0137	.0147	.0157	.0168	.0180	.0192	.0204	.0217
17	.0063	.0069	.0075	.0081	.0088	.0095	.0103	.0111	.0119	.0128
18	.0032	.0035	.0039	.0042	.0046	.0051	.0055	.0060	.0065	.0071
19	.0015	.0017	.0019	.0021	.0023	.0026	.0028	.0031	.0034	.0037
20	.0007	.0008	.0009	.0010	.0011	.0012	.0014	.0015	.0017	.0019
21	.0003	.0003	.0004	.0004	.0005	.0006	.0006	.0007	.0008	.0009
22	.0001	.0001	.0002	.0002	.0002	.0002	.0003	.0003	.0004	.0004
23	.0000	.0001	.0001	.0001	.0001	.0001	.0001	.0001	.0002	.0002
24	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0001	.0001	.0001



**Table IV Standard Normal Distribution Table**

The entries in this table give the cumulative area under the standard normal curve to the left of  $z$  with the values of  $z$  equal to 0 or negative.

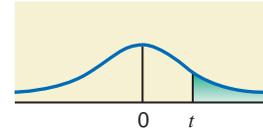


$z$	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
-3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
-3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
-3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
-3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
-3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
-2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
-2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
-2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
-2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
-2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
-2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
-2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
-2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
-2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
-2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
-1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
-1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
-1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
-1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
-1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
-1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
-1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
-1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
-1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
-1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
-0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
-0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
-0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
-0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
-0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
-0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
-0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
-0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
-0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641



**Table V The  $t$  Distribution Table**

The entries in this table give the critical values of  $t$  for the specified number of degrees of freedom and areas in the right tail.



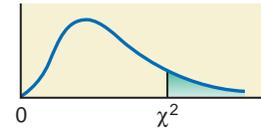
$df$	Area in the Right Tail Under the $t$ Distribution Curve					
	.10	.05	.025	.01	.005	.001
1	3.078	6.314	12.706	31.821	63.657	318.309
2	1.886	2.920	4.303	6.965	9.925	22.327
3	1.638	2.353	3.182	4.541	5.841	10.215
4	1.533	2.132	2.776	3.747	4.604	7.173
5	1.476	2.015	2.571	3.365	4.032	5.893
6	1.440	1.943	2.447	3.143	3.707	5.208
7	1.415	1.895	2.365	2.998	3.499	4.785
8	1.397	1.860	2.306	2.896	3.355	4.501
9	1.383	1.833	2.262	2.821	3.250	4.297
10	1.372	1.812	2.228	2.764	3.169	4.144
11	1.363	1.796	2.201	2.718	3.106	4.025
12	1.356	1.782	2.179	2.681	3.055	3.930
13	1.350	1.771	2.160	2.650	3.012	3.852
14	1.345	1.761	2.145	2.624	2.977	3.787
15	1.341	1.753	2.131	2.602	2.947	3.733
16	1.337	1.746	2.120	2.583	2.921	3.686
17	1.333	1.740	2.110	2.567	2.898	3.646
18	1.330	1.734	2.101	2.552	2.878	3.610
19	1.328	1.729	2.093	2.539	2.861	3.579
20	1.325	1.725	2.086	2.528	2.845	3.552
21	1.323	1.721	2.080	2.518	2.831	3.527
22	1.321	1.717	2.074	2.508	2.819	3.505
23	1.319	1.714	2.069	2.500	2.807	3.485
24	1.318	1.711	2.064	2.492	2.797	3.467
25	1.316	1.708	2.060	2.485	2.787	3.450
26	1.315	1.706	2.056	2.479	2.779	3.435
27	1.314	1.703	2.052	2.473	2.771	3.421
28	1.313	1.701	2.048	2.467	2.763	3.408
29	1.311	1.699	2.045	2.462	2.756	3.396
30	1.310	1.697	2.042	2.457	2.750	3.385
31	1.309	1.696	2.040	2.453	2.744	3.375
32	1.309	1.694	2.037	2.449	2.738	3.365
33	1.308	1.692	2.035	2.445	2.733	3.356
34	1.307	1.691	2.032	2.441	2.728	3.348
35	1.306	1.690	2.030	2.438	2.724	3.340

**Table V The *t* Distribution Table (continued)**

<i>df</i>	Area in the Right Tail Under the <i>t</i> Distribution Curve					
	.10	.05	.025	.01	.005	.001
36	1.306	1.688	2.028	2.434	2.719	3.333
37	1.305	1.687	2.026	2.431	2.715	3.326
38	1.304	1.686	2.024	2.429	2.712	3.319
39	1.304	1.685	2.023	2.426	2.708	3.313
40	1.303	1.684	2.021	2.423	2.704	3.307
41	1.303	1.683	2.020	2.421	2.701	3.301
42	1.302	1.682	2.018	2.418	2.698	3.296
43	1.302	1.681	2.017	2.416	2.695	3.291
44	1.301	1.680	2.015	2.414	2.692	3.286
45	1.301	1.679	2.014	2.412	2.690	3.281
46	1.300	1.679	2.013	2.410	2.687	3.277
47	1.300	1.678	2.012	2.408	2.685	3.273
48	1.299	1.677	2.011	2.407	2.682	3.269
49	1.299	1.677	2.010	2.405	2.680	3.265
50	1.299	1.676	2.009	2.403	2.678	3.261
51	1.298	1.675	2.008	2.402	2.676	3.258
52	1.298	1.675	2.007	2.400	2.674	3.255
53	1.298	1.674	2.006	2.399	2.672	3.251
54	1.297	1.674	2.005	2.397	2.670	3.248
55	1.297	1.673	2.004	2.396	2.668	3.245
56	1.297	1.673	2.003	2.395	2.667	3.242
57	1.297	1.672	2.002	2.394	2.665	3.239
58	1.296	1.672	2.002	2.392	2.663	3.237
59	1.296	1.671	2.001	2.391	2.662	3.234
60	1.296	1.671	2.000	2.390	2.660	3.232
61	1.296	1.670	2.000	2.389	2.659	3.229
62	1.295	1.670	1.999	2.388	2.657	3.227
63	1.295	1.669	1.998	2.387	2.656	3.225
64	1.295	1.669	1.998	2.386	2.655	3.223
65	1.295	1.669	1.997	2.385	2.654	3.220
66	1.295	1.668	1.997	2.384	2.652	3.218
67	1.294	1.668	1.996	2.383	2.651	3.216
68	1.294	1.668	1.995	2.382	2.650	3.214
69	1.294	1.667	1.995	2.382	2.649	3.213
70	1.294	1.667	1.994	2.381	2.648	3.211
71	1.294	1.667	1.994	2.380	2.647	3.209
72	1.293	1.666	1.993	2.379	2.646	3.207
73	1.293	1.666	1.993	2.379	2.645	3.206
74	1.293	1.666	1.993	2.378	2.644	3.204
75	1.293	1.665	1.992	2.377	2.643	3.202
∞	1.282	1.645	1.960	2.326	2.576	3.090

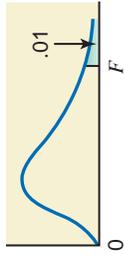
Table VI Chi-Square Distribution Table

The entries in this table give the critical values of  $\chi^2$  for the specified number of degrees of freedom and areas in the right tail.



<i>df</i>	Area in the Right Tail Under the Chi-square Distribution Curve									
	.995	.990	.975	.950	.900	.100	.050	.025	.010	.005
1	0.000	0.000	0.001	0.004	0.016	2.706	3.841	5.024	6.635	7.879
2	0.010	0.020	0.051	0.103	0.211	4.605	5.991	7.378	9.210	10.597
3	0.072	0.115	0.216	0.352	0.584	6.251	7.815	9.348	11.345	12.838
4	0.207	0.297	0.484	0.711	1.064	7.779	9.488	11.143	13.277	14.860
5	0.412	0.554	0.831	1.145	1.610	9.236	11.070	12.833	15.086	16.750
6	0.676	0.872	1.237	1.635	2.204	10.645	12.592	14.449	16.812	18.548
7	0.989	1.239	1.690	2.167	2.833	12.017	14.067	16.013	18.475	20.278
8	1.344	1.646	2.180	2.733	3.490	13.362	15.507	17.535	20.090	21.955
9	1.735	2.088	2.700	3.325	4.168	14.684	16.919	19.023	21.666	23.589
10	2.156	2.558	3.247	3.940	4.865	15.987	18.307	20.483	23.209	25.188
11	2.603	3.053	3.816	4.575	5.578	17.275	19.675	21.920	24.725	26.757
12	3.074	3.571	4.404	5.226	6.304	18.549	21.026	23.337	26.217	28.300
13	3.565	4.107	5.009	5.892	7.042	19.812	22.362	24.736	27.688	29.819
14	4.075	4.660	5.629	6.571	7.790	21.064	23.685	26.119	29.141	31.319
15	4.601	5.229	6.262	7.261	8.547	22.307	24.996	27.488	30.578	32.801
16	5.142	5.812	6.908	7.962	9.312	23.542	26.296	28.845	32.000	34.267
17	5.697	6.408	7.564	8.672	10.085	24.769	27.587	30.191	33.409	35.718
18	6.265	7.015	8.231	9.390	10.865	25.989	28.869	31.526	34.805	37.156
19	6.844	7.633	8.907	10.117	11.651	27.204	30.144	32.852	36.191	38.582
20	7.434	8.260	9.591	10.851	12.443	28.412	31.410	34.170	37.566	39.997
21	8.034	8.897	10.283	11.591	13.240	29.615	32.671	35.479	38.932	41.401
22	8.643	9.542	10.982	12.338	14.041	30.813	33.924	36.781	40.289	42.796
23	9.260	10.196	11.689	13.091	14.848	32.007	35.172	38.076	41.638	44.181
24	9.886	10.856	12.401	13.848	15.659	33.196	36.415	39.364	42.980	45.559
25	10.520	11.524	13.120	14.611	16.473	34.382	37.652	40.646	44.314	46.928
26	11.160	12.198	13.844	15.379	17.292	35.563	38.885	41.923	45.642	48.290
27	11.808	12.879	14.573	16.151	18.114	36.741	40.113	43.195	46.963	49.645
28	12.461	13.565	15.308	16.928	18.939	37.916	41.337	44.461	48.278	50.993
29	13.121	14.256	16.047	17.708	19.768	39.087	42.557	45.722	49.588	52.336
30	13.787	14.953	16.791	18.493	20.599	40.256	43.773	46.979	50.892	53.672
40	20.707	22.164	24.433	26.509	29.051	51.805	55.758	59.342	63.691	66.766
50	27.991	29.707	32.357	34.764	37.689	63.167	67.505	71.420	76.154	79.490
60	35.534	37.485	40.482	43.188	46.459	74.397	79.082	83.298	88.379	91.952
70	43.275	45.442	48.758	51.739	55.329	85.527	90.531	95.023	100.425	104.215
80	51.172	53.540	57.153	60.391	64.278	96.578	101.879	106.629	112.329	116.321
90	59.196	61.754	65.647	69.126	73.291	107.565	113.145	118.136	124.116	128.299
100	67.328	70.065	74.222	77.929	82.358	118.498	124.342	129.561	135.807	140.169

**Table VII The F Distribution Table**

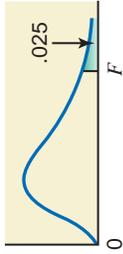


The entries in this table give the critical values of  $F$  for .01 area in the right tail under the  $F$  distribution curve and specified degrees of freedom for the numerator and denominator.

		Degrees of Freedom for the Numerator																		
		1	2	3	4	5	6	7	8	9	10	11	12	15	20	25	30	40	50	100
1	4052	5000	5403	5625	5764	5859	5928	5981	6022	6056	6083	6106	6157	6209	6240	6261	6287	6303	6334	
2	98.50	99.00	99.17	99.25	99.30	99.33	99.36	99.37	99.39	99.40	99.41	99.42	99.43	99.45	99.46	99.47	99.47	99.48	99.49	
3	34.12	30.82	29.46	28.71	28.24	27.91	27.67	27.49	27.35	27.23	27.13	27.05	26.87	26.69	26.58	26.50	26.41	26.35	26.24	
4	21.20	18.00	16.69	15.98	15.52	15.21	14.98	14.80	14.66	14.55	14.45	14.37	14.20	14.02	13.91	13.84	13.75	13.69	13.58	
5	16.26	13.27	12.06	11.39	10.97	10.67	10.46	10.29	10.16	10.05	9.96	9.89	9.72	9.55	9.45	9.38	9.29	9.24	9.13	
6	13.75	10.92	9.78	9.15	8.75	8.47	8.26	8.10	7.98	7.87	7.79	7.72	7.56	7.40	7.30	7.23	7.14	7.09	6.99	
7	12.25	9.55	8.45	7.85	7.46	7.19	6.99	6.84	6.72	6.62	6.54	6.47	6.31	6.16	6.06	5.99	5.91	5.86	5.75	
8	11.26	8.65	7.59	7.01	6.63	6.37	6.18	6.03	5.91	5.81	5.73	5.67	5.52	5.36	5.26	5.20	5.12	5.07	4.96	
9	10.56	8.02	6.99	6.42	6.06	5.80	5.61	5.47	5.35	5.26	5.18	5.11	4.96	4.81	4.71	4.65	4.57	4.52	4.41	
10	10.04	7.56	6.55	5.99	5.64	5.39	5.20	5.06	4.94	4.85	4.77	4.71	4.56	4.41	4.31	4.25	4.17	4.12	4.01	
11	9.65	7.21	6.22	5.67	5.32	5.07	4.89	4.74	4.63	4.54	4.46	4.40	4.25	4.10	4.01	3.94	3.86	3.81	3.71	
12	9.33	6.93	5.95	5.41	5.06	4.82	4.64	4.50	4.39	4.30	4.22	4.16	4.01	3.86	3.76	3.70	3.62	3.57	3.47	
13	9.07	6.70	5.74	5.21	4.86	4.62	4.44	4.30	4.19	4.10	4.02	3.96	3.82	3.66	3.57	3.51	3.43	3.38	3.27	
14	8.86	6.51	5.56	5.04	4.69	4.46	4.28	4.14	4.03	3.94	3.86	3.80	3.66	3.51	3.41	3.35	3.27	3.22	3.11	
15	8.68	6.36	5.42	4.89	4.56	4.32	4.14	4.00	3.89	3.80	3.73	3.67	3.52	3.37	3.28	3.21	3.13	3.08	2.98	
16	8.53	6.23	5.29	4.77	4.44	4.20	4.03	3.89	3.78	3.69	3.62	3.55	3.41	3.26	3.16	3.10	3.02	2.97	2.86	
17	8.40	6.11	5.18	4.67	4.34	4.10	3.93	3.79	3.68	3.59	3.52	3.46	3.31	3.16	3.07	3.00	2.92	2.87	2.76	
18	8.29	6.01	5.09	4.58	4.25	4.01	3.84	3.71	3.60	3.51	3.43	3.37	3.23	3.08	2.98	2.92	2.84	2.78	2.68	
19	8.18	5.93	5.01	4.50	4.17	3.94	3.77	3.63	3.52	3.43	3.36	3.30	3.15	3.00	2.91	2.84	2.76	2.71	2.60	
20	8.10	5.85	4.94	4.43	4.10	3.87	3.70	3.56	3.46	3.37	3.29	3.23	3.09	2.94	2.84	2.78	2.69	2.64	2.54	
21	8.02	5.78	4.87	4.37	4.04	3.81	3.64	3.51	3.40	3.31	3.24	3.17	3.03	2.88	2.79	2.72	2.64	2.58	2.48	
22	7.95	5.72	4.82	4.31	3.99	3.76	3.59	3.45	3.35	3.26	3.18	3.12	2.98	2.83	2.73	2.67	2.58	2.53	2.42	
23	7.88	5.66	4.76	4.26	3.94	3.71	3.54	3.41	3.30	3.21	3.14	3.07	2.93	2.78	2.69	2.62	2.54	2.48	2.37	
24	7.82	5.61	4.72	4.22	3.90	3.67	3.50	3.36	3.26	3.17	3.09	3.03	2.89	2.74	2.64	2.58	2.49	2.44	2.33	
25	7.77	5.57	4.68	4.18	3.85	3.63	3.46	3.32	3.22	3.13	3.06	2.99	2.85	2.70	2.60	2.54	2.45	2.40	2.29	
30	7.56	5.39	4.51	4.02	3.70	3.47	3.30	3.17	3.07	2.98	2.91	2.84	2.70	2.55	2.45	2.39	2.30	2.25	2.13	
40	7.31	5.18	4.31	3.83	3.51	3.29	3.12	2.99	2.89	2.80	2.73	2.66	2.52	2.37	2.27	2.20	2.11	2.06	1.94	
50	7.17	5.06	4.20	3.72	3.41	3.19	3.02	2.89	2.78	2.70	2.63	2.56	2.42	2.27	2.17	2.10	2.01	1.95	1.82	
100	6.90	4.82	3.98	3.51	3.21	2.99	2.82	2.69	2.59	2.50	2.43	2.37	2.22	2.07	1.97	1.89	1.80	1.74	1.60	

Degrees of Freedom for the Denominator

**Table VII The F Distribution Table (continued)**

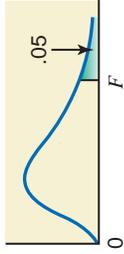


The entries in this table give the critical values of  $F$  for .025 area in the right tail under the  $F$  distribution curve and specified degrees of freedom for the numerator and denominator.

		Degrees of Freedom for the Numerator																		
		1	2	3	4	5	6	7	8	9	10	11	12	15	20	25	30	40	50	100
1	647.8	799.5	864.2	899.6	921.8	937.1	948.2	956.7	963.3	968.6	973.0	976.7	984.9	993.1	998.1	1001	1006	1008	1013	1013
2	38.51	39.00	39.17	39.25	39.30	39.33	39.36	39.37	39.39	39.40	39.41	39.41	39.43	39.45	39.46	39.46	39.47	39.48	39.49	39.49
3	17.44	16.04	15.44	15.10	14.88	14.73	14.62	14.54	14.47	14.42	14.37	14.34	14.25	14.17	14.12	14.08	14.04	14.01	13.96	13.96
4	12.22	10.65	9.98	9.61	9.36	9.20	9.07	8.98	8.90	8.84	8.79	8.75	8.66	8.56	8.50	8.46	8.41	8.38	8.32	8.32
5	10.01	8.43	7.76	7.39	7.15	6.98	6.85	6.76	6.68	6.62	6.57	6.52	6.43	6.33	6.27	6.23	6.18	6.14	6.08	6.08
6	8.81	7.26	6.60	6.23	5.99	5.82	5.70	5.60	5.52	5.46	5.41	5.37	5.27	5.17	5.11	5.07	5.01	4.98	4.92	4.92
7	8.07	6.54	5.89	5.52	5.29	5.12	4.99	4.90	4.82	4.76	4.71	4.67	4.57	4.47	4.40	4.36	4.31	4.28	4.21	4.21
8	7.57	6.06	5.42	5.05	4.82	4.65	4.53	4.43	4.36	4.30	4.24	4.20	4.10	4.00	3.94	3.89	3.84	3.81	3.74	3.74
9	7.21	5.72	5.08	4.72	4.48	4.32	4.20	4.10	4.03	3.96	3.91	3.87	3.77	3.67	3.60	3.56	3.51	3.47	3.40	3.40
10	6.94	5.46	4.83	4.47	4.24	4.07	3.95	3.85	3.78	3.72	3.66	3.62	3.52	3.42	3.35	3.31	3.26	3.22	3.15	3.15
11	6.72	5.26	4.63	4.28	4.04	3.88	3.76	3.66	3.59	3.53	3.47	3.43	3.33	3.23	3.16	3.12	3.06	3.03	2.96	2.96
12	6.55	5.10	4.47	4.12	3.89	3.73	3.61	3.51	3.44	3.37	3.32	3.28	3.18	3.07	3.01	2.96	2.91	2.87	2.80	2.80
13	6.41	4.97	4.35	4.00	3.77	3.60	3.48	3.39	3.31	3.25	3.20	3.15	3.05	2.95	2.88	2.84	2.78	2.74	2.67	2.67
14	6.30	4.86	4.24	3.89	3.66	3.50	3.38	3.29	3.21	3.15	3.09	3.05	2.95	2.84	2.78	2.73	2.67	2.64	2.56	2.56
15	6.20	4.77	4.15	3.80	3.58	3.41	3.29	3.20	3.12	3.06	3.01	2.96	2.86	2.76	2.69	2.64	2.59	2.55	2.47	2.47
16	6.12	4.69	4.08	3.73	3.50	3.34	3.22	3.12	3.05	2.99	2.93	2.89	2.79	2.68	2.61	2.57	2.51	2.47	2.40	2.40
17	6.04	4.62	4.01	3.66	3.44	3.28	3.16	3.06	2.98	2.92	2.87	2.82	2.72	2.62	2.55	2.50	2.44	2.41	2.33	2.33
18	5.98	4.56	3.95	3.61	3.38	3.22	3.10	3.01	2.93	2.87	2.81	2.77	2.67	2.56	2.49	2.44	2.38	2.35	2.27	2.27
19	5.92	4.51	3.90	3.56	3.33	3.17	3.05	2.96	2.88	2.82	2.76	2.72	2.62	2.51	2.44	2.39	2.33	2.30	2.22	2.22
20	5.87	4.46	3.86	3.51	3.29	3.13	3.01	2.91	2.84	2.77	2.72	2.68	2.57	2.46	2.40	2.35	2.29	2.25	2.17	2.17
21	5.83	4.42	3.82	3.48	3.25	3.09	2.97	2.87	2.80	2.73	2.68	2.64	2.53	2.42	2.36	2.31	2.25	2.21	2.13	2.13
22	5.79	4.38	3.78	3.44	3.22	3.05	2.93	2.84	2.76	2.70	2.65	2.60	2.50	2.39	2.32	2.27	2.21	2.17	2.09	2.09
23	5.75	4.35	3.75	3.41	3.18	3.02	2.90	2.81	2.73	2.67	2.62	2.57	2.47	2.36	2.29	2.24	2.18	2.14	2.06	2.06
24	5.72	4.32	3.72	3.38	3.15	2.99	2.87	2.78	2.70	2.64	2.59	2.54	2.44	2.33	2.26	2.21	2.15	2.11	2.02	2.02
25	5.69	4.29	3.69	3.35	3.13	2.97	2.85	2.75	2.68	2.61	2.56	2.51	2.41	2.30	2.23	2.18	2.12	2.08	2.00	2.00
30	5.57	4.18	3.59	3.25	3.03	2.87	2.75	2.65	2.57	2.51	2.46	2.41	2.31	2.20	2.12	2.07	2.01	1.97	1.88	1.88
40	5.42	4.05	3.46	3.13	2.90	2.74	2.62	2.53	2.45	2.39	2.33	2.29	2.18	2.07	1.99	1.94	1.88	1.83	1.74	1.74
50	5.34	3.97	3.39	3.05	2.83	2.67	2.55	2.46	2.38	2.32	2.26	2.22	2.11	1.99	1.92	1.87	1.80	1.75	1.66	1.66
100	5.18	3.83	3.25	2.92	2.70	2.54	2.42	2.32	2.24	2.18	2.12	2.08	1.97	1.85	1.77	1.71	1.64	1.59	1.48	1.48

Degrees of Freedom for the Denominator

**Table VII The F Distribution Table (continued)**

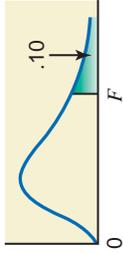


The entries in this table give the critical values of  $F$  for .05 area in the right tail under the  $F$  distribution curve and specified degrees of freedom for the numerator and denominator.

		Degrees of Freedom for the Numerator																		
		1	2	3	4	5	6	7	8	9	10	11	12	15	20	25	30	40	50	100
1	161.5	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5	241.9	243.0	243.9	246.0	248.0	249.3	250.1	251.1	251.8	253.0	253.0
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.40	19.41	19.43	19.45	19.46	19.46	19.47	19.48	19.49	19.49
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.76	8.74	8.70	8.66	8.63	8.62	8.59	8.58	8.55	8.55
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.94	5.91	5.86	5.80	5.77	5.75	5.72	5.70	5.66	5.66
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.70	4.68	4.62	4.56	4.52	4.50	4.46	4.44	4.41	4.41
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.03	4.00	3.94	3.87	3.83	3.81	3.77	3.75	3.71	3.71
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.60	3.57	3.51	3.44	3.40	3.38	3.34	3.32	3.27	3.27
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.31	3.28	3.22	3.15	3.11	3.08	3.04	3.02	2.97	2.97
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.10	3.07	3.01	2.94	2.89	2.86	2.83	2.80	2.76	2.76
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.94	2.91	2.85	2.77	2.73	2.70	2.66	2.64	2.59	2.59
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.82	2.79	2.72	2.65	2.60	2.57	2.53	2.51	2.46	2.46
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.72	2.69	2.62	2.54	2.50	2.47	2.43	2.40	2.35	2.35
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.63	2.60	2.53	2.46	2.41	2.38	2.34	2.31	2.26	2.26
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.57	2.53	2.46	2.39	2.34	2.31	2.27	2.24	2.19	2.19
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.51	2.48	2.40	2.33	2.28	2.25	2.20	2.18	2.12	2.12
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49	2.46	2.42	2.35	2.28	2.23	2.19	2.15	2.12	2.07	2.07
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45	2.41	2.38	2.31	2.23	2.18	2.15	2.10	2.08	2.02	2.02
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41	2.37	2.34	2.27	2.19	2.14	2.11	2.06	2.04	1.98	1.98
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38	2.34	2.31	2.23	2.16	2.11	2.07	2.03	2.00	1.94	1.94
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35	2.31	2.28	2.20	2.12	2.07	2.04	1.99	1.97	1.91	1.91
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32	2.28	2.25	2.18	2.10	2.05	2.01	1.96	1.94	1.88	1.88
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30	2.26	2.23	2.15	2.07	2.02	1.97	1.94	1.91	1.85	1.85
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27	2.24	2.20	2.13	2.05	2.00	1.96	1.91	1.88	1.82	1.82
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25	2.22	2.18	2.11	2.03	1.97	1.94	1.89	1.86	1.80	1.80
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.24	2.20	2.16	2.09	2.01	1.96	1.92	1.87	1.84	1.78	1.78
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.13	2.09	2.01	1.93	1.88	1.84	1.79	1.76	1.70	1.70
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08	2.04	2.00	1.92	1.84	1.78	1.74	1.69	1.66	1.59	1.59
50	4.03	3.18	2.79	2.56	2.40	2.29	2.20	2.13	2.07	2.03	1.99	1.95	1.87	1.78	1.73	1.69	1.63	1.60	1.52	1.52
100	3.94	3.09	2.70	2.46	2.31	2.19	2.10	2.03	1.97	1.93	1.89	1.85	1.77	1.68	1.62	1.57	1.52	1.48	1.39	1.39

Degrees of Freedom for the Denominator

**Table VII The F Distribution Table (continued)**



The entries in this table give the critical values of  $F$  for .10 area in the right tail under the  $F$  distribution curve and specified degrees of freedom for the numerator and denominator.

	Degrees of Freedom for the Numerator																		
	1	2	3	4	5	6	7	8	9	10		11	12	15	20	25	30	40	50
1	39.86	49.50	53.59	55.83	57.24	58.20	58.91	59.44	59.86	60.19	60.47	60.71	61.22	61.74	62.05	62.26	62.53	62.69	63.01
2	8.53	9.00	9.16	9.24	9.29	9.33	9.35	9.37	9.38	9.39	9.40	9.41	9.42	9.44	9.45	9.46	9.47	9.47	9.48
3	5.54	5.46	5.39	5.34	5.31	5.28	5.27	5.25	5.24	5.23	5.22	5.22	5.20	5.18	5.17	5.17	5.16	5.15	5.14
4	4.54	4.32	4.19	4.11	4.05	4.01	3.98	3.95	3.94	3.92	3.91	3.90	3.87	3.84	3.83	3.82	3.80	3.80	3.78
5	4.06	3.78	3.62	3.52	3.45	3.40	3.37	3.34	3.32	3.30	3.28	3.27	3.24	3.21	3.19	3.17	3.16	3.15	3.13
6	3.78	3.46	3.29	3.18	3.11	3.05	3.01	2.98	2.96	2.94	2.92	2.90	2.87	2.84	2.81	2.80	2.78	2.77	2.75
7	3.59	3.26	3.07	2.96	2.88	2.83	2.78	2.75	2.72	2.70	2.68	2.67	2.63	2.59	2.57	2.56	2.54	2.52	2.50
8	3.46	3.11	2.92	2.81	2.73	2.67	2.62	2.59	2.56	2.54	2.52	2.50	2.46	2.42	2.40	2.38	2.36	2.35	2.32
9	3.36	3.01	2.81	2.69	2.61	2.55	2.51	2.47	2.44	2.42	2.40	2.38	2.34	2.30	2.27	2.25	2.23	2.22	2.19
10	3.29	2.92	2.73	2.61	2.52	2.46	2.41	2.38	2.35	2.32	2.30	2.28	2.24	2.20	2.17	2.16	2.13	2.12	2.09
11	3.23	2.86	2.66	2.54	2.45	2.39	2.34	2.30	2.27	2.25	2.23	2.21	2.17	2.12	2.10	2.08	2.05	2.04	2.01
12	3.18	2.81	2.61	2.48	2.39	2.33	2.28	2.24	2.21	2.19	2.17	2.15	2.10	2.06	2.03	2.01	1.99	1.97	1.94
13	3.14	2.76	2.56	2.43	2.35	2.28	2.23	2.20	2.16	2.14	2.12	2.10	2.05	2.01	1.98	1.96	1.93	1.92	1.88
14	3.10	2.73	2.52	2.39	2.31	2.24	2.19	2.15	2.12	2.10	2.07	2.05	2.01	1.96	1.93	1.91	1.89	1.87	1.83
15	3.07	2.70	2.49	2.36	2.27	2.21	2.16	2.12	2.09	2.06	2.04	2.02	1.97	1.92	1.89	1.87	1.85	1.83	1.79
16	3.05	2.67	2.46	2.33	2.24	2.18	2.13	2.09	2.06	2.03	2.01	1.99	1.94	1.89	1.86	1.84	1.81	1.79	1.76
17	3.03	2.64	2.44	2.31	2.22	2.15	2.10	2.06	2.03	2.00	1.98	1.96	1.91	1.86	1.83	1.81	1.78	1.76	1.73
18	3.01	2.62	2.42	2.29	2.20	2.13	2.08	2.04	2.00	1.98	1.95	1.93	1.89	1.84	1.80	1.78	1.75	1.74	1.70
19	2.99	2.61	2.40	2.27	2.18	2.11	2.06	2.02	1.98	1.96	1.93	1.91	1.86	1.81	1.78	1.76	1.73	1.71	1.67
20	2.97	2.59	2.38	2.25	2.16	2.09	2.04	2.00	1.96	1.94	1.91	1.89	1.84	1.79	1.76	1.74	1.71	1.69	1.65
21	2.96	2.57	2.36	2.23	2.14	2.08	2.02	1.98	1.95	1.92	1.90	1.87	1.83	1.78	1.74	1.72	1.69	1.67	1.63
22	2.95	2.56	2.35	2.22	2.13	2.06	2.01	1.97	1.93	1.90	1.88	1.86	1.81	1.76	1.73	1.70	1.67	1.65	1.61
23	2.94	2.55	2.34	2.21	2.11	2.05	1.99	1.95	1.92	1.89	1.87	1.84	1.80	1.74	1.71	1.69	1.66	1.64	1.59
24	2.93	2.54	2.33	2.19	2.10	2.04	1.98	1.94	1.91	1.88	1.85	1.83	1.78	1.73	1.70	1.67	1.64	1.62	1.58
25	2.92	2.53	2.32	2.18	2.09	2.02	1.97	1.93	1.89	1.87	1.84	1.82	1.77	1.72	1.68	1.66	1.63	1.61	1.56
30	2.88	2.49	2.28	2.14	2.05	1.98	1.93	1.88	1.85	1.82	1.79	1.77	1.72	1.67	1.63	1.61	1.57	1.55	1.51
40	2.84	2.44	2.23	2.09	2.00	1.93	1.87	1.83	1.79	1.76	1.74	1.71	1.66	1.61	1.57	1.54	1.51	1.48	1.43
50	2.81	2.41	2.20	2.06	1.97	1.90	1.84	1.80	1.76	1.73	1.70	1.68	1.63	1.57	1.53	1.50	1.46	1.44	1.39
100	2.76	2.36	2.14	2.00	1.91	1.83	1.78	1.73	1.69	1.66	1.64	1.61	1.56	1.49	1.45	1.42	1.38	1.35	1.29

Degrees of Freedom for the Denominator



## Statistical Tables on the Web Site

**Note:** The following tables are on the Web site of the text along with Chapters 14 and 15.

**Table VIII** Critical Values of  $X$  for the Sign Test

**Table IX** Critical Values of  $T$  for the Wilcoxon Signed-Rank Test

**Table X** Critical Values of  $T$  for the Wilcoxon Rank Sum Test

**Table XI** Critical Values for the Spearman Rho Rank Correlation Coefficient Test

**Table XII** Critical Values for a Two-Tailed Runs Test with  $\alpha = .05$

# ANSWERS TO SELECTED ODD-NUMBERED EXERCISES AND SELF-REVIEW TESTS

(Note: Due to differences in rounding, the answers obtained by readers may differ slightly from the ones given in this Appendix.)

## Chapter 1

- 1.7 a. population b. sample c. population  
d. sample e. population
- 1.11 a. number of dog bites reported last year  
b. six observations c. six elements
- 1.15 a. quantitative b. quantitative c. qualitative  
d. quantitative e. quantitative
- 1.17 a. discrete b. continuous d. discrete  
e. continuous
- 1.21 a. cross-section data b. cross-section data  
c. time-series data d. time-series data
- 1.23 a.  $\Sigma f = 69$  b.  $\Sigma m^2 = 1363$  c.  $\Sigma mf = 922$   
d.  $\Sigma m^2 f = 17,128$
- 1.25 a.  $\Sigma x = 112$  b.  $\Sigma y = 45$  c.  $\Sigma xy = 222$   
d.  $\Sigma y^2 = 285$  e.  $(\Sigma y)^2 = 2025$
- 1.27 a.  $\Sigma x = 856$  b.  $(\Sigma x)^2 = 732,736$   
c.  $\Sigma x^2 = 157,574$
- 1.29 a.  $\Sigma x = 148$  b.  $(\Sigma x)^2 = 21,904$   
c.  $\Sigma x^2 = 4486$
- 1.33 a. sample b. population for the year  
c. sample d. population
- 1.35 a. sampling without replacement b. sampling with replacement
- 1.37 a.  $\Sigma x = 47$  b.  $(\Sigma x)^2 = 2209$  c.  $\Sigma x^2 = 443$
- 1.39 a.  $\Sigma m = 59$  b.  $\Sigma f^2 = 2662$  c.  $\Sigma mf = 1508$   
d.  $\Sigma m^2 f = 24,884$  e.  $\Sigma m^2 = 867$

## Self-Review Test

1. b 2. c 3. a. sampling without replacement  
b. sampling with replacement
4. a. qualitative b. quantitative (continuous)  
c. quantitative (discrete) d. qualitative
6. a.  $\Sigma x = 29$  b.  $(\Sigma x)^2 = 841$  c.  $\Sigma x^2 = 231$
7. a.  $\Sigma m = 45$  b.  $\Sigma f = 112$  c.  $\Sigma m^2 = 495$   
d.  $\Sigma mf = 975$  e.  $\Sigma m^2 f = 9855$  f.  $\Sigma f^2 = 2994$

## Chapter 2

- 2.3 c. 26.7% d. 73.4%
- 2.5 c. 52% 2.7 c. 50% 2.15 d. 62%
- 2.17 a. class limits: \$1–\$25, \$26–\$50, \$51–\$75, \$76–\$100, \$101–\$125, \$126–\$150 b. class boundaries: \$5, \$25.5, \$50.5, \$75.5, \$100.5, \$125.5, \$150.5; width = \$25 c. class midpoints: \$13, \$38, \$63, \$88, \$113, \$138

- 2.19 d. 30% 2.29 c. 11
- 2.35 c. 38% e. about 52% 2.43 6 teams
- 2.47 218, 245, 256, 329, 367, 383, 397, 404, 427, 433, 471, 523, 537, 551, 563, 581, 592, 622, 636, 647, 655, 678, 689, 810, 841
- 2.67 d. 27.5% 2.69 c. 16.7% 2.71 c. 56.7%
- 2.73 d. Boundaries of the fourth class are \$4200.5 and \$5600.5; width = \$1400.
- 2.87 No. The older group may drive more miles per week than the younger group.

## Self-Review Test

2. a. 5 b. 7 c. 17 d. 6.5 e. 13  
f. 90 g. .30
4. c. 35% 5. c. 70.8%
8. 30, 33, 37, 42, 44, 46, 47, 49, 51, 53, 53, 56, 60, 67, 67, 71, 79

## Chapter 3

- 3.5 mode 3.9 mean = 3.00; median = 3.50; no mode
- 3.11 mean = \$3779.44; median = \$3250
- 3.13 a. mean = \$272.98 billion; median = \$162 billion  
b. mode = \$34 billion and \$216 billion
- 3.15 mean = £48.515 million; median = £37.6 million
- 3.17 mean = \$529.67 million;  
median = \$449.5 million; no mode
- 3.19 mean = 2.92 power outages; median = 2.5 power outages; mode = 2 power outages
- 3.21 mean = 29.4; median = 28.5; mode = 23
- 3.23 a. mean = 1803; median = 1270 b. outlier = 5490; when the outlier is dropped: mean = 1467.8; median = 1166; mean changes by a larger amount  
c. median
- 3.25 combined mean = \$148.89 3.27 total = \$1055
- 3.29 age of the sixth person = 48 years
- 3.31 mean for data set I = 24.60; mean for data set II = 31.60  
The mean of the second data set is equal to the mean of the first data set plus 7.
- 3.33 10% trimmed mean = 38.25 years 3.35 weighted mean = 77.5
- 3.41 range = 25;  $\sigma^2 = 61.5$ ;  $\sigma = 7.84$
- 3.43 a.  $\bar{x} = 9$ ; deviations from the mean: -2, 1, -1, -6, 6, 3, -3, 2. The sum of these deviations is zero.  
b. range = 12;  $s^2 = 14.2857$ ;  $s = 3.78$
- 3.45 range = 13;  $s^2 = 13.8409$ ;  $s = 3.72$

## AN2 Answers to Selected Odd-Numbered Exercises and Self-Review Tests

- 3.47 range = 27 pieces;  $s^2 = 78.1$ ;  $s = 8.84$  pieces  
 3.49 range = 7 stings;  $s^2 = 4.5769$ ;  $s = 2.14$  stings  
 3.51 range = 30;  $s^2 = 107.4286$ ;  $s = 10.36$   
 3.53 range = 38;  $s^2 = 151.7778$ ;  
 $s = 12.3198$   
 3.55  $s = 0$   
 3.57 CV for salaries = 10.94%; CV for years of experience = 13.33%; The relative variation in salaries is lower.  
 3.59  $s = 14.64$  for both data sets  
 3.63  $\bar{x} = 9.40$ ;  $s^2 = 37.7114$ ;  $s = 6.14$   
 3.65  $\mu = 14$  hours;  $\sigma^2 = 51.9167$ ;  $\sigma = 7.21$  hours  
 3.67  $\bar{x} = 19.67$ ;  $s^2 = 67.6979$ ;  $s = 8.23$   
 3.69  $\bar{x} = 36.80$  minutes;  $s^2 = 597.7143$ ;  $s = 24.45$  minutes  
 3.71 a.  $\bar{x} = \$139.05$  c.  $\bar{x} = \$138.93$   
 3.75 at least 75%; at least 84%; at least 89%  
 3.77 68%; 95%; 99.7%  
 3.79 a. at least 75% b. at least 84%  
 c. at least 89%  
 3.81 a. i. at least 75% ii. at least 89%  
 b. \$1515 to \$3215  
 3.83 a. 99.7% b. 68% c. 95%  
 3.85 a. i. 99.7% ii. 68% b. 66 to 78 mph  
 3.91 a.  $Q_1 = 69$ ;  $Q_2 = 73$ ;  $Q_3 = 76.5$ ;  $IQR = 7.5$   
 b.  $P_{35} = 70$  c. 30.77%  
 3.93 a.  $Q_1 = 369$ ;  $Q_2 = 386.5$ ;  $Q_3 = 417$ ;  $IQR = 48$   
 b.  $P_{57} = 390$  c. 73.33%  
 3.95 a.  $Q_1 = 25$ ;  $Q_2 = 28.5$ ;  $Q_3 = 33$ ;  $IQR = 8$   
 b.  $P_{65} = 31$  c. 33.33%  
 3.97 a.  $Q_1 = 533$ ;  $Q_2 = 626.5$ ;  $Q_3 = 728$ ;  
 $IQR = 195$  b.  $P_{30} = 552.5$  c. 23%  
 3.99 no outlier  
 3.109 a. mean = \$106.5 thousand; median = \$76 thousand  
 b. outlier = 382; when the outlier is dropped: mean = \$75.9 thousand; median = \$74 thousand; mean changes by a larger amount c. median  
 3.111 a. mean = 1973.6 points; median = 1917.5 points; mode none b. range = 544 points;  $s^2 = 42084.93$ ;  $s = 205.15$  points  
 3.113  $\bar{x} = 5.08$  inches;  $s^2 = 6.8506$ ;  $s = 2.62$  inches  
 3.115 a. i. at least 75% ii. at least 89%  
 b. 160 to 240 minutes  
 3.117 a. i. 68% ii. 95% b. 140 to 260 minutes  
 3.119 a.  $Q_1 = 60$ ;  $Q_2 = 76$ ;  $Q_3 = 97$ ;  $IQR = 37$   
 b.  $P_{70} = 84$  c. 70%  
 3.121 The data set is skewed slightly to the right; 135 is an outlier.  
 3.123 The minimum score is 169.  
 3.125 a. new mean = 76.4 inches; new median = 78 inches; new range = 13 inches b. new mean = 75.2 inches  
 3.127 mean = \$54.46 per barrel  
 3.129 a. trimmed mean = 9.5 b. 14.3%  
 3.131 a. age 30 and under: rate for A = 25; rate for B = 20 b. age 31 and over: rate for A = 100; rate for B = 85.7 c. overall: rate for A = 50; rate for B = 58.3 d. Country A has the lower overall average because 66.67% of its population is under 30.  
 3.133 a.  $k = 1.41$  b.  $k = 2.24$  3.135 b. median  
 3.137 b. For men: mean = 82, median = 79, modes = 75, 79, and 92,  $s = 12.08$ ,  $Q_1 = 73.5$ ,  $Q_3 = 89.5$ , and  $IQR = 16$ . For women: mean = 97.53, median = 98, modes = 94 and 100,  $s = 8.44$ ,  $Q_1 = 94$ ,  $Q_3 = 101$ , and  $IQR = 7$   
 3.139 a. mean = 30 b. mean = 50

- 3.141 a. at least 55.56% b. 1 to 11 inches  
 c. 2.66 to 9.34 inches  
 3.143 a. For men: mean = 174.91 lbs = 76,189.05 grams = 12.49 stone, median = 179 lbs = 77,970.61 grams = 12.79 stone, and st. dev. = 19.12 lbs = 8328.48 grams = 1.37 stone. For women: mean = 124.95 lbs = 54,426.97 grams = 8.93 stone, median = 123 lbs = 53,577.57 grams = 8.79 stone, st. dev. = 17.48 lbs = 7614.11 grams = 1.25 stone. b. see answer to a, as answers are identical.  
 c. yes d & e. Smaller unit has more variability.  
 3.145 108 to 111

### Self-Review Test

1. b 2. a and d 3. c 4. c 5. b  
 6. b 7. a 8. a 9. b 10. a 11. b  
 12. c 13. a 14. a  
 15. mean = 10.9; median = 8; mode = 6; range = 26;  $s^2 = 65.2111$ ;  $s = 8.08$   
 19. b.  $\bar{x} = 19.46$ ;  $s^2 = 44.0400$ ;  $s = 6.64$   
 20. a. i. at least 84% ii. at least 89%  
 b. 2.9 to 11.7 years  
 21. a. i. 68% ii. 99.7% b. 2.9 to 11.7 years  
 22. a.  $Q_1 = 3$ ;  $Q_2 = 8$ ;  $Q_3 = 13$ ;  $IQR = 10$   
 b.  $P_{60} = 10$  c. 66.67%  
 23. Data are skewed slightly to the right.  
 24. combined mean = \$1066.43  
 25. GPA of fifth student = 3.17  
 26. 10% trimmed mean = 376.625; trimmed mean is a better measure  
 27. a. mean for data set I = 19.75; mean for data set II = 16.75. The mean of the second data set is equal to the mean of the first data set minus 3. b.  $s = 11.32$  for both data sets.

### Chapter 4

- 4.3  $S = \{AB, AC, BA, BC, CA, CB\}$   
 4.5 four possible outcomes;  $S = \{NN, NI, IN, II\}$   
 4.7 four possible outcomes;  $S = \{DD, DG, GD, GG\}$   
 4.9  $S = \{HHH, HHT, HTH, HTT, THH, THT, TTH, TTT\}$   
 4.11 a. {NI and IN}; a compound event  
 b. {II, NI, and IN}; a compound event  
 c. {NN, IN, and NI}; a compound event  
 d. {IN}; a simple event  
 4.13 a. {DG, GD, and GG}; a compound event  
 b. {DG and GD}; a compound event  
 c. {GD}; a simple event  
 d. {DD, DG, and GD}; a compound event  
 4.19  $-.55, 1.56, 5/3, -2/7$   
 4.21 not equally likely events; use relative frequency approach  
 4.23 subjective probability  
 4.25 a. .450 b. .550 4.27 .660 4.29 .160  
 4.31 a. .200 b. .800 4.33 .6667; .3333  
 4.35 .325; .675 4.37 a. .0939 b. .5  
 4.39 use relative frequency approach 4.45 1296  
 4.47 a. no b. no c.  $\bar{A} = \{1, 3, 4, 6, 8\}$ ;  
 $\bar{B} = \{1, 3, 5, 6, 7\}$ ;  $P(\bar{A}) = .625$ ;  $P(\bar{B}) = .625$   
 4.49 50 4.51 960 4.53 a. i. .600 ii. .600  
 iii. .375 iv. .583 b. Events "male" and "female" are mutually exclusive. Events "have shopped" and "male" are not mutually exclusive. c. Events "female" and "have shopped" are dependent.

- 4.55 a. i. .3475 ii. .5425 iii. .2727  
iv. .4545 b. Events “male” and “in favor” are not mutually exclusive. Events “in favor” and “against” are mutually exclusive. c. Events “female” and “no opinion” are dependent.
- 4.57 a. i. .1012 ii. .4835 iii. .5524  
iv. .1014 b. Events “Airline A” and “more than 1 hour late” are not mutually exclusive. Events “less than 30 minutes late” and “more than one hour late” are mutually exclusive. c. Events “Airline B” and “30 minutes to 1 hour late” are dependent.
- 4.59 Events “female” and “pediatrician” are dependent but not mutually exclusive.
- 4.61 Events “female” and “business major” are dependent but not mutually exclusive.
- 4.63  $P(A) = .3333$ ;  $P(\bar{A}) = .6667$  4.65 .88
- 4.71 a. .4543 b. .0980
- 4.73 a. .1520 b. .1824
- 4.75 a. .2462 b. .1086
- 4.77 .6923 4.79 .725
- 4.81 a. i. .3844 ii. .1590 b. .0000
- 4.83 a. i. .350 ii. .150
- 4.85 a. i. .225 ii. .035 b. .0000
- 4.87 .3529 4.89 .2667 4.91 .1600
- 4.93 a. .0025 b. .9025 4.95 .5120
- 4.97 .5278 4.99 .40
- 4.105 a. .56 b. .76 4.107 a. .52 b. .67
- 4.109 a. .6358 b. .9075
- 4.111 a. .750 b. .750 c. 1.0
- 4.113 a. .780 b. .550 c. .790
- 4.115 .910 4.117 .77
- 4.119 .700 4.121 .80 4.123 .9744
- 4.125 a. .2571 b. .1429
- 4.127 a. i. .4360 ii. .4800 iii. .3462  
iv. .6809 v. .3400 vi. .6600  
b. Events “female” and “prefers watching sports” are dependent but not mutually exclusive.
- 4.129 a. i. .750 ii. .700 iii. .225 iv. .775  
b. Events “student athlete” and “should be paid” are dependent but not mutually exclusive.
- 4.131 a. .7242 b. .2758 4.133 .0605
- 4.135 .0048 4.137 a. 17,576,000 b. 5200
- 4.139 a.  $1/195,249,054 = .0000000051$   
b.  $1/5,138,133 = .00000019$
- 4.141 a. .5000 b. .3333 c. No; the sixth toss is independent of the first five tosses. Equivalent to part a.
- 4.143 a. .030 b. .150
- 4.145 a. .50 b. .50 4.147 a. .8333 b. .1667
- 4.149 a. .01% b. i. .0048 ii. .0028  
iii. .0222 iv. .0111 4.151 a. .8851  
b. .0035

**Self-Review Test**

1. a 2. b 3. c 4. a 5. a 6. b  
7. c 8. b 9. b 10. c 11. b
12. 120 13. a. .3333 b. .6667
14. a. Events “female” and “out of state” are dependent but not mutually exclusive. b. i. .4500 ii. .6364
15. .825 16. .3894 17. .4225 18. .40; .60
19. a. .279 b. .829

20. a. i. .358 ii. .405 iii. .235 iv. .5593  
b. Events “woman” and “yes” are dependent but not mutually exclusive.

**Chapter 5**

- 5.3 a. discrete random variable b. continuous random variable  
c. continuous random variable  
d. discrete random variable e. discrete random variable  
f. continuous random variable
- 5.5 discrete random variable
- 5.9 a. not a valid probability distribution b. a valid probability distribution  
c. not a valid probability distribution
- 5.11 a. .17 b. .20 c. .58 d. .42  
e. .42 f. .27 g. .68
- 5.13 b. i. .51 ii. .235 iii. .285 iv. .305
- 5.15 a. 

$x$	1	2	3	4	5
$P(x)$	.10	.25	.30	.20	.15

  
b. approximate c. i. .30 ii. .65  
iii. .75 iv. .65
- 5.17 

$x$	0	1	2
$P(x)$	.5271	.3978	.0751
- 5.19 

$x$	0	1	2
$P(x)$	.3969	.4662	.1369
- 5.21 

$x$	0	1	2
$P(x)$	.4789	.4422	.0789
- 5.23 a.  $\mu = 1.590$ ;  $\sigma = .960$  b.  $\mu = 7.070$ ;  
 $\sigma = 1.061$
- 5.25  $\mu = .440$  error;  $\sigma = .852$  error
- 5.27  $\mu = 2.94$  camcorders;  $\sigma = 1.441$  camcorders
- 5.29  $\mu = 1.00$  head;  $\sigma = .707$  head
- 5.31  $\mu = 2.5604$  tires;  $\sigma = 1.3223$  tires
- 5.33  $\mu = .100$  lemon;  $\sigma = .308$  lemon
- 5.35  $\mu = \$3.9$  million;  $\sigma = \$3.015$  million
- 5.37  $\mu = .500$  person;  $\sigma = .584$  person
- 5.39  $3! = 6$ ;  $(9 - 3)! = 720$ ;  $9! = 362,880$ ;  
 $(14 - 12)! = 2$ ;  ${}_5C_3 = 10$ ;  ${}_7C_4 = 35$ ;  ${}_9C_3 = 84$ ;  
 ${}_4C_0 = 1$ ;  ${}_3C_3 = 1$ ;  ${}_6P_2 = 30$ ;  ${}_8P_4 = 1680$   
 ${}_9C_2 = 36$ ;  ${}_9P_2 = 72$  5.43  ${}_{12}C_3 = 220$ ;  ${}_{12}P_3 = 1320$
- 5.45  ${}_{20}C_6 = 38,760$ ;  ${}_{20}P_6 = 27,907,200$
- 5.47 167,960
- 5.51 a. not a binomial experiment  
b. a binomial experiment  
c. a binomial experiment
- 5.53 a. .2541 b. .1536 c. .3241
- 5.55 b.  $\mu = 2.100$ ;  $\sigma = 1.212$
- 5.59 a. 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 b. .1161
- 5.61 a. .0314 b. .3552 c. .8076
- 5.63 a. .0913 b. .0000 c. .0122
- 5.65 a. .2725 b. .0839
- 5.67 a.  $\mu = 5.6$  customers;  $\sigma = 1.058$  customers b. .1147
- 5.69 a.  $\mu = 5.600$  customers;  $\sigma = 1.296$  customers  
b. .0467
- 5.71 a. .4286 b. .0714 c. .5
- 5.73 a. .3818 b. .0030 c. .5303
- 5.75 a. .4747; b. .0440 c. .3407
- 5.77 a. .1078 b. .5147 c. .8628
- 5.81 a. .0404 b. .2565
- 5.83 a.  $\mu = 1.3$ ;  $\sigma^2 = 1.3$ ;  $\sigma = 1.140$  b.  $\mu = 2.1$ ;  
 $\sigma^2 = 2.1$ ;  $\sigma = 1.449$

## AN4 Answers to Selected Odd-Numbered Exercises and Self-Review Tests

- 5.85 .1496    5.87 .1185  
 5.89 a. .1162    b. i. .6625    ii. .1699  
 iii. .4941  
 5.91 a. .3033    b. i. .0900    ii. .0018  
 iii. .9098  
 5.93 a. .0031    b. i. .0039    ii. .4911  
 5.95 a. .2466    c.  $\mu = 1.4$   $\sigma^2 = 1.4$   
 $\sigma = 1.183$   
 5.97 a. .0446    b. i. .0390    ii. .2580  
 iii. .0218  
 5.99  $\mu = 4.11$ ;  $\sigma = 1.019$ ; This mechanic repairs, on average,  
 4.11 cars per day  
 5.101 b.  $\mu = \$557,000$ ;  $\sigma = \$1,288,274$ ;  $\mu$  gives the  
 company's expected profit.  
 5.103 a. .0000    b. .0351    c. .7214  
 5.105 a. .9246    b. .0754  
 5.107 a. .3692    b. .1429    c. .0923  
 5.109 a. .8643    b. .1357  
 5.111 a. .0912    b. i. .5502    ii. .0817  
 iii. .2933  
 5.113 a. .2466  
 5.115  $\sum_x P(x) = -2.22$ . This game is not fair to you and you  
 should not play as you expect to lose \$2.22.  
 5.117 a. .0625    b. .125    c. .3125  
 5.119 c. .7149    d. 3 nights  
 5.121 8 cheesecakes  
 5.123 a. 35    b. 10    c. .2857    5.127 \$6  
 5.129 a. .0211    b. .0475    c. .4226

### Self-Review Test

2. probability distribution table  
 3. a    4. b    5. a    7. b    8. a  
 9. b    10. a    11. c    13. a  
 15.  $\mu = 2.040$  homes;  $\sigma = 1.449$  homes  
 16. a. i. .2128    ii. .8418    iii. .0153  
 b.  $\mu = 7.2$  adults;  $\sigma = 1.697$  adults  
 17. a. .4525    b. .0646    c. .0666  
 18. a. i. .0521    ii. .2203    iii. .2013

## Chapter 6

- 6.11 .8664    6.13 .9876  
 6.15 a. .4744    b. .4798    c. .1162    d. .0610  
 e. .9400  
 6.17 a. .0869    b. .0244    c. .9798    d. .9608  
 6.19 a. .5 approximately    b. .5 approximately  
 c. .00 approximately    d. .00 approximately  
 6.21 a. .9613    b. .4783    c. .4767    d. .0694  
 6.23 a. .0096    b. .2466    c. .1570    d. .9625  
 6.25 a. .8365    b. .8947    c. approximately .5  
 d. approximately .5    e. approximately .00  
 f. approximately .00  
 6.27 a. 1.80    b. -2.20    c. -1.20    d. 2.80  
 6.29 a. .4599    b. .1598    c. .2223  
 6.31 a. .3336    b. .9564    c. .9686  
 d. approximately .00  
 6.33 a. .2178    b. .6440  
 6.35 a. .8212    b. .2810    c. .0401    d. .7190  
 6.37 a. .0764    b. .1126  
 6.39 a. .0985    b. .0538

- 6.41 a. 93.32%    b. 15.57%  
 6.43 a. .0197    b. .3296  
 6.45 a. .8264    b. 12.83%  
 6.47 a. 15.62%    b. 7.64%  
 6.49 a. 0.39%    b. 1.46%    c. 18.72%  
 d. 29.21%  
 6.51 2.64%  
 6.53 a. 2.00    b. -2.02 approximately  
 c. -.37 approximately    d. 1.02 approximately  
 6.55 a. approximately 1.65    b. -1.96    c. -2.33  
 approximately    d. 2.58 approximately  
 6.57 a. 208.50    b. 241.25    c. 178.50  
 d. 145.75    e. 158.25    f. 251.25  
 6.59 19 minutes approximately  
 6.61 2060 kilowatt-hours  
 6.63 \$82.02 approximately  
 6.65  $np > 5$  and  $nq > 5$   
 6.67 a. .7688    b. .7697; difference is .0009  
 6.69 a.  $\mu = 72$ ;  $\sigma = 5.36656315$     b. .3192  
 c. .4564  
 6.71 a. .0764    b. .6793    c. .8413    d. .8238  
 6.73 .0735    6.75 a. .0351    b. .1875    c. .1230  
 6.77 a. .0454    b. .0516    c. .8646  
 6.79 a. .7549    b. .2451  
 6.81 a. .1093    b. 9.31%    c. 57.33%  
 d. It is possible, but its probability is close to zero.  
 .0124 or 1.24%  
 6.83 a. 848 hours    b. 792 hours approximately  
 6.85 a. .0454    b. .0838    c. .8861    d. .2477  
 6.87 a. .0454    b. .0838    c. .8861    d. .2477  
 6.89 \$2136    6.91 a. 85.08%    b. \$4000  
 6.93 .0091  
 6.95 a. at most .0062    b. 65 mph  
 6.97 8.16 ounces  
 6.99 company A: \$.0490    company B: \$.0508  
 6.101 a. .7967    b. 62  
 6.105 .1064

### Self-Review Test

1. a    2. a    3. d    4. b    5. a    6. c  
 7. b    8. b  
 9. a. .1878    b. .9304    c. .0985    d. .7704  
 10. a. -1.28 approximately    b. .61    c. 1.65  
 approximately    d. -1.07 approximately  
 11. a. .5608    b. .0015    c. .0170    d. .1165  
 12. a. 48669.8    b. 40162  
 13. a. i. .0318    ii. .9453    iii. .9099  
 iv. .0268    v. .4632    b. .7054    c. .3986

## Chapter 7

- 7.5 a. 16.60    b. sampling error = -.27  
 c. sampling error = -.27; nonsampling error = 1.11  
 d.  $\bar{x}_1 = 16.22$ ;  $\bar{x}_2 = 15.67$ ;  $\bar{x}_3 = 17.00$ ;  $\bar{x}_4 = 16.33$ ;  
 $\bar{x}_5 = 17.44$ ;  $\bar{x}_6 = 16.78$ ;  $\bar{x}_7 = 17.22$ ;  
 $\bar{x}_8 = 17.67$ ;  $\bar{x}_9 = 16.56$ ;  $\bar{x}_{10} = 15.11$   
 7.7 b.  $\bar{x}_1 = 28.4$ ;  $\bar{x}_2 = 28.8$ ;  $\bar{x}_3 = 33.8$ ;  $\bar{x}_4 = 34.4$ ;  
 $\bar{x}_5 = 35.2$ ;  $\bar{x}_6 = 36.4$ ;    c.  $\mu = 32.83$   
 7.13 a.  $\mu_{\bar{x}} = 60$ ;  $\sigma_{\bar{x}} = 2.357$   
 b.  $\mu_{\bar{x}} = 60$ ;  $\sigma_{\bar{x}} = 1.054$   
 7.15 a.  $\sigma_{\bar{x}} = 1.400$     b.  $\sigma_{\bar{x}} = 2.500$

- 7.17 a.  $n = 100$     b.  $n = 256$   
 7.19  $\mu_{\bar{x}} = \$3.084$ ;  $\sigma_{\bar{x}} = \$0.038$   
 7.21  $\mu_{\bar{x}} = \$520$ ;  $\sigma_{\bar{x}} = \$14.40$     7.23  $n = 256$   
 7.25 a.  $\mu_{\bar{x}} = 80.60$     b.  $\sigma_{\bar{x}} = 3.302$   
 d.  $\sigma_{\bar{x}} = 3.302$   
 7.33  $\mu_{\bar{x}} = 20.20$  hours;  $\sigma_{\bar{x}} = .613$  hours; the normal distribution  
 7.35  $\mu_{\bar{x}} = 3.020$ ;  $\sigma_{\bar{x}} = .042$ ; approximately normal distribution  
 7.37  $n = 20$ :  $\mu_{\bar{x}} = 91.4$  grams;  $\sigma_{\bar{x}} = 20.851$  grams; skewed to the right  
 $n = 75$ :  $\mu_{\bar{x}} = 91.4$  grams;  $\sigma_{\bar{x}} = \$10.768$  grams; approximately normal distribution  
 7.39  $\mu_{\bar{x}} = 200$  pieces;  $\sigma_{\bar{x}} = 15.821$  pieces; approximately normal distribution; no, sample size  $\geq 30$   
 7.41 86.64%  
 7.43 a.  $z = 2.44$     b.  $z = -7.25$     c.  $z = -3.65$   
 d.  $z = 5.82$   
 7.45 a. .1940    b. .8749  
 7.47 a. .0003    b. .9292  
 7.49 a. .1093    b. .0322    c. .7776  
 7.51 a. .0150    b. .0968    c. .5696  
 7.53 a. .8203    b. .9750  
 7.55 a. .1147    b. .9164    c. .1251  
 7.57 a. .1032    b. .3172    c. .0016    d. .9049  
 7.59 .0124    7.61  $p = .12$ ;  $\hat{p} = .15$   
 7.63 7125 subjects in the population; 312 subjects in the sample  
 7.65 sampling error =  $-.05$   
 7.71 a.  $\mu_{\hat{p}} = .21$ ;  $\sigma_{\hat{p}} = .020$   
 b.  $\mu_{\hat{p}} = .21$ ;  $\sigma_{\hat{p}} = .015$   
 7.73 a.  $\sigma_{\hat{p}} = .051$     b.  $\sigma_{\hat{p}} = .071$   
 7.77 a.  $p = .667$     b. 6    d.  $-.067, -.067, .133, .133, -.067, -.067$   
 7.79  $\mu_{\hat{p}} = .30$ ;  $\sigma_{\hat{p}} = .034$ ; approximately normal distribution  
 7.81  $\mu_{\hat{p}} = .561$ ;  $\sigma_{\hat{p}} = .027$ ; approximately normal distribution  
 7.83 95.44%  
 7.85 a.  $z = -.61$     b.  $z = 1.83$     c.  $z = -1.22$   
 d.  $z = 1.22$   
 7.87 a. .0721    b. .1798  
 7.89 a. .0030    b. .2678  
 7.91 .2005  
 7.93  $\mu_{\bar{x}} = 750$  hours;  $\sigma_{\bar{x}} = 11$  hours; the normal distribution  
 7.95 a. .9131    b. .1698    c. .8262    d. .0344  
 7.97 a. .489    b. .0006    c. .8064    d. .8643  
 7.99  $\mu_{\hat{p}} = .88$ ;  $\sigma_{\hat{p}} = .036$ ; approximately normal distribution  
 7.101 a. i. .0146    ii. .0907    b. .9912    c. .0146  
 7.103 .6318  
 7.105 10 approximately  
 7.107 a. .8023    b. 754 approximately  
 7.109 .0035

### Self-Review Test

1. b    2. b    3. a    4. a    5. b  
 6. b    7. c    8. a    9. a  
 10. a    11. c    12. a  
 14. a.  $\mu_{\bar{x}} = 145$  pounds;  $\sigma_{\bar{x}} = 3.600$  pounds; approximately normal distribution

b.  $\mu_{\bar{x}} = 145$  pounds;  $\sigma_{\bar{x}} = 1.800$  pounds; approximately normal distribution

15. a.  $\mu_{\bar{x}} = 45,000$  miles;  $\sigma_{\bar{x}} = 527.71$  miles; unknown distribution  
 b.  $\mu_{\bar{x}} = 45,000$  miles;  $\sigma_{\bar{x}} = 292.72$  miles; approximately normal distribution  
 16. a. .1541    b. .4582    c. .0003    d. .1706  
 e. .0084  
 17. a. i. .1203    ii. .1335    iii. .7486  
 b. .9736    c. .0013  
 18. a.  $\mu_{\hat{p}} = .048$ ;  $\sigma_{\hat{p}} = .0302$ ; unknown distribution  
 b.  $\mu_{\hat{p}} = .048$ ;  $\sigma_{\hat{p}} = .0096$ ; approximately normal distribution  
 c.  $\mu_{\hat{p}} = .048$ ;  $\sigma_{\hat{p}} = .0030$ ; approximately normal distribution  
 19. a. i. .0080    ii. .4466    iii. .7823  
 iv. .2815    b. .5820    c. .1936    d. .0606

### Chapter 8

- 8.11 a. 24.5    b. 22.71 to 26.29    c.  $\pm 1.79$   
 8.13 a. 70.59 to 79.01    b. 69.80 to 79.80  
 c. 68.22 to 81.38    d. yes  
 8.15 a. 77.84 to 85.96    b. 78.27 to 85.53  
 c. 78.65 to 85.15    d. yes  
 8.17 a. 38.34    b. 37.30 to 39.38    c.  $\pm 1.04$   
 8.19 a.  $n = 167$     b.  $n = 65$   
 8.21 a.  $n = 299$     b.  $n = 126$     c.  $n = 61$   
 8.23 \$295,146.86 to \$304,293.14  
 8.25 a. 48,903.27 to 58,196.73 labor-hours  
 8.27 31.86 to 32.02 ounces; no adjustment needed  
 8.29 a. \$1532.41 to \$1617.59  
 8.31  $n = 167$     8.33  $n = 61$   
 8.41 a.  $t = -1.325$     b.  $t = 2.160$     c.  $t = 3.281$   
 d.  $t = -2.715$   
 8.43 a.  $\alpha \approx .10$ , left tail    b.  $\alpha = .005$ , right tail  
 c.  $\alpha = .10$ , right tail    d.  $\alpha \approx .01$  left tail  
 8.45 a.  $t = 2.080$     b.  $t = 1.671$     c.  $t = 2.807$   
 8.47 a. 1.41    b.  $-3.40$  to  $6.22$     c.  $\pm 4.81$   
 8.49 a. 24.06 to 26.94    b. 23.58 to 27.42  
 c. 23.73 to 27.27  
 8.51 a. 91.03 to 93.87    b. 90.06 to 93.44  
 c. 88.06 to 91.20    d. confidence intervals of parts b and c cover  $\mu$ , that of part a does not  
 8.53 40.04 to 42.36 bushels  
 8.55 .32 to .36 grams  
 8.57 18.64 to 25.36 minutes  
 8.59 a. 21.56 to 24.44 hours  
 8.61 4.88 to 11.12 hours  
 8.63 7.20 to 8.14 ounces  
 8.65 a. 6.18 years  
 b. 5.85 to 6.51 years; margin of error:  $\pm .33$  year  
 8.71 a. yes, sample size is large    b. no, sample size is not large    c. yes, sample size is large    d. yes, sample size is large  
 8.73 a. .297 to .343    b. .336 to .384  
 c. .277 to .323    d. confidence intervals of parts a and b cover  $p$ , but that of part c does not  
 8.75 a. .189 to .351    b. .202 to .338  
 c. .218 to .322    d. yes

## AN6 Answers to Selected Odd-Numbered Exercises and Self-Review Tests

- 8.77 a. .284 to .336 b. .269 to .351  
c. .209 to .411 d. yes
- 8.79 a.  $n = 668$  b.  $n = 671$
- 8.81 a.  $n = 1432$  b.  $n = 196$  c.  $n = 353$
- 8.83 a. .29 to .45
- 8.85 a. 40% b. 33.1% to 46.9%; margin of error =  $\pm 6.9\%$
- 8.87 a. 20.3% to 55.7% 8.89 a. 12.3% to 17.1%
- 8.91 a. .333 b. 8.5% to 58.1%
- 8.93  $n = 1084$
- 8.95  $n = 1849$
- 8.99 a. \$2640  
b. \$2514.57 to \$2765.43
- 8.101 3.969 to 4.011 inches; the machine needs to be adjusted
- 8.103 12.5 to 16.5 gallons
- 8.105 21.76 to 26.24 minutes
- 8.107 4.4 to 4.6 hours
- 8.109 144.33 to 158.47 calories
- 8.111 a. .03 b. .014 to .046
- 8.113 6.1% to 56.4%
- 8.115  $n = 221$  8.117  $n = 359$
- 8.121  $n = 65$
- 8.123 a.  $n = 20$  days b. 90% c.  $\pm 75$  cars

### Self-Review Test

- a. population parameter; sample statistic  
b. sample statistic; population parameter  
c. sample statistic; population parameter
- b 3. a 4. a 5. c 6. b
- a. \$159,000  
b. \$147,390 to \$170,610; margin of error =  $\pm$  \$11,610
- \$379,539.30 to \$441,310.70 9. a. .55  
b. .489 to .611
- $n = 83$  11.  $n = 273$  12.  $n = 229$

### Chapter 9

- 9.5 a. a left-tailed test b. a right-tailed test  
c. a two-tailed test
- 9.7 a. Type II error b. Type I error
- 9.9 a.  $H_0: \mu = 20$  hours;  $H_1: \mu \neq 20$  hours; a two-tailed test b.  $H_0: \mu = 10$  hours;  $H_1: \mu > 10$  hours; a right-tailed test  
c.  $H_0: \mu = 3$  years;  $H_1: \mu \neq 3$  years; a two-tailed test  
d.  $H_0: \mu = \$1000$ ;  $H_1: \mu < \$1000$ ; a left-tailed test e.  $H_0: \mu = 12$  minutes;  $H_1: \mu > 12$  minutes; a right-tailed test
- 9.17 a.  $p$ -value = .0188 b.  $p$ -value = .0116  
c.  $p$ -value = .0087
- 9.19 a.  $p$ -value = .0166 b. no, do not reject  $H_0$   
c. yes, reject  $H_0$
- 9.21 a. rejection region is to the left of  $-2.58$  and to the right of  $2.58$ ; nonrejection region is between  $-2.58$  and  $2.58$   
b. rejection region is to the left of  $-2.58$ ; nonrejection region is to the right of  $-2.58$   
c. rejection region is to the right of  $1.96$ ; nonrejection region is to the left of  $1.96$
- 9.23 Statistically not significant
- 9.25 a. .10 b. .02 c. .005
- 9.27 a. observed value of  $z$  is .58; critical value of  $z$  is  $\pm 1.96$   
b. observed value of  $z$  is .58; critical value of  $z$  is  $1.65$

- 9.29 a. reject  $H_0$  if  $z > 1.65$  b. reject  $H_0$  if  $z < -1.65$   
c. reject  $H_0$  if  $z < -1.96$  or  $z > 1.96$
- 9.31 a. critical value:  $z = -1.96$ ; test statistic:  $z = -2.67$ ; reject  $H_0$  b. critical value:  $z = -1.96$ ; test statistic:  $z = -1.00$ ; do not reject  $H_0$
- 9.33 a. critical values:  $z = -1.65$  and  $1.65$ ; test statistic:  $z = -1.34$ ; do not reject  $H_0$  b. critical value:  $z = -2.33$ ; test statistic:  $z = -6.44$ ; reject  $H_0$   
c. critical value:  $z = 1.65$ ; test statistic:  $z = 8.70$ ; reject  $H_0$
- 9.35 a.  $H_0: \mu = 45$ ;  $H_1: \mu < 45$  months;  $p$  value = .0170; if  $\alpha = .025$  reject  $H_0$  b. test statistic:  $z = -2.12$ ; Critical value:  $z = -1.96$ ; reject  $H_0$
- 9.37 a.  $H_0: \mu \geq 25$  years;  $H_1: \mu < 25$  years;  $p$  value = .0418; if  $\alpha = .025$ , do not reject  $H_0$   
b. Critical value:  $z = -1.96$ ; observed value:  $z = -1.73$ ; do not reject  $H_0$
- 9.39 a.  $H_0: \mu = 10$  minutes;  $H_1: \mu \neq 10$  minutes; test statistic:  $z = -2.11$ ;  $p$  value = .0348 If  $\alpha = .02$ , do not reject  $H_0$ . If  $\alpha = .05$ , reject  $H_0$ . b. Observed value  $z = -2.11$ ; If  $\alpha = .02$ , critical values:  $z = -2.33$  and  $2.33$ ; do not reject  $H_0$ . If  $\alpha = .05$ , critical values:  $z = -1.96$  and  $1.96$ ; reject  $H_0$ .
- 9.41 a. test statistic:  $z = -2.33$ ;  $p$  value = .0198; If  $\alpha = .01$ ; do not reject  $H_0$ ; If  $\alpha = .05$ , reject  $H_0$ .  
b. Observed value  $z = -2.33$ ; If  $\alpha = .01$ , critical values:  $z = -2.58$  and  $2.58$ , do not reject  $H_0$ ; If  $\alpha = .05$ , critical values:  $z = -1.96$  and  $1.96$ ; reject  $H_0$ .
- 9.43 a.  $H_0: \mu \geq 47.93$  boxes;  $H_1: \mu < 47.93$  boxes; critical value:  $z = -1.28$ ; test statistic:  $z = -1.16$ ; do not reject  $H_0$   
b. reject  $H_0$ .
- 9.45 a.  $H_0: \mu \geq 8$  hours;  $H_1: \mu < 8$  hours; critical value:  $z = -2.33$ ;  $\alpha = .01$ ; test statistic:  $z = -.68$ ;  $p$  value = .2483 do not reject  $H_0$ . b. critical value:  $z = -1.96$ ; test statistic:  $z = -.68$ ; do not reject  $H_0$ .
- 9.49 a. reject  $H_0$  if  $t < -2.977$  or  $t > 2.977$  b. reject  $H_0$  if  $t < -2.797$  c. reject  $H_0$  if  $t > 2.080$
- 9.51 a. critical values:  $t = -2.365$  and  $2.365$ ; observed value:  $t = -2.097$ ;  $.05 < p$  value  $< .10$  b. critical value:  $t = -1.895$ ; observed value:  $t = -2.097$ ;  $.025 < p$  value  $< .05$
- 9.53 a. reject  $H_0$  if  $t > 1.672$  b. reject  $H_0$  if  $t < -1.672$   
c. reject  $H_0$  if  $t < -2.002$  or  $t > 2.002$
- 9.55 a. critical value:  $t = 1.998$ ; test statistic:  $t = 4.800$ ; reject  $H_0$  b. critical value:  $t = 1.998$ ; test statistic:  $t = 1.143$ ; do not reject  $H_0$
- 9.57 a. critical value:  $t = -1.363$ ; test statistic:  $t = -1.252$ ; do not reject  $H_0$  b. critical values:  $t = -2.064$  and  $2.064$ ; test statistic:  $t = 2.258$ ; reject  $H_0$  c. critical value:  $t = 3.143$ ; test statistic:  $t = 2.658$ ; do not reject  $H_0$
- 9.59  $H_0: \mu \leq 4.145$  minutes;  $H_1: \mu > 4.145$  minutes; critical value:  $t = 1.301$ ; test statistic:  $t = 1.862$ ; reject  $H_0$ ;  $.025 < p$  value  $< .05$ ; reject  $H_0$
- 9.61  $H_0: \mu = \$850$ ;  $H_1: \mu < \$850$ ; critical value:  $t = -2.397$ ; test statistic:  $t = -2.257$ ; do not reject  $H_0$ ; if  $\alpha = .025$ , critical value =  $-2.005$ ; reject  $H_0$
- 9.63  $H_0: \mu = 14.325$  homes;  $H_1: \mu \neq 14.325$  homes; test statistic:  $t = -.752$ ;  $p$ -value  $> .10$ ; do not reject  $H_0$ ; for  $\alpha = .05$ , critical values:  $t = -2.020$  and  $t = 2.020$ ; test statistic:  $t = -.752$ ; do not reject  $H_0$

- 9.65** a.  $H_0: \mu \geq \$150$ ;  $H_1: \mu < \$150$ ; test statistic:  $t = -1.964$ ;  $.025 < p\text{-value} < .050$ ; do not reject  $H_0$ ; for  $\alpha = .01$ , critical value:  $t = -2.492$ ; test statistic:  $t = -1.964$ ; do not reject  $H_0$     b.  $\alpha = .01$
- 9.67** a.  $H_0: \mu = 58$  years;  $H_1: \mu \neq 58$  years; if  $\alpha = 0$ , do not reject  $H_0$     b. test statistic:  $t = -4.183$ ;  $p\text{-value} < .002$ ; for  $\alpha = .01$ , reject  $H_0$ ; critical values:  $t = -2.649$  and  $2.649$ ; test statistic:  $t = -4.183$ ; reject  $H_0$
- 9.69**  $H_0: \mu = \$95$ ;  $H_1: \mu > \$95$ ; critical value:  $t = 1.771$ ; test statistic:  $t = 2.130$ ; reject  $H_0$
- 9.71**  $H_0: \mu = \$3.084$ ;  $H_1: \mu < \$3.084$ ; test statistic:  $t = -2.024$ ;  $.01 < p\text{ value} < .025$ ; do not reject  $H_0$ ; critical value:  $t = -2.326$ ; do not reject  $H_0$
- 9.75** a. not large enough    b. large enough  
c. not large enough    d. large enough
- 9.77** a. reject  $H_0$  if  $z < -1.65$  or  $z > 1.65$     b. reject  $H_0$  if  $z < -2.33$     c. reject  $H_0$  if  $z > 1.65$
- 9.79** a. critical value:  $z = 1.65$ ; observed value:  $z = 3.90$   
b. critical values:  $z = -1.96$  and  $1.96$ ; observed value:  $z = 3.90$
- 9.81** a. reject  $H_0$  if  $z < -1.65$     b. reject  $H_0$  if  $z < -1.96$  or  $z > 1.96$     c. reject  $H_0$  if  $z > 1.65$
- 9.83** a. critical values:  $z = -2.58$  and  $2.58$ ; test statistic:  $z = -1.07$ ; do not reject  $H_0$     b. critical values:  $z = -2.58$  and  $2.58$ ; test statistic:  $z = 3.21$ ; reject  $H_0$
- 9.85** a. critical values:  $z = -1.65$  and  $1.65$ ; test statistic:  $z = .80$ ; do not reject  $H_0$     b. critical value:  $z = -1.65$ ; test statistic:  $z = -4.71$ ; reject  $H_0$     c. critical value:  $z = 2.33$ ; test statistic:  $z = .93$ ; do not reject  $H_0$
- 9.87**  $H_0: p = .30$ ;  $H_1: p < .30$ ; test statistic:  $z = -1.75$ ;  $p\text{ value} = .0401$ ; for  $\alpha = .05$ , reject  $H_0$ ; critical value for  $\alpha = .05$ :  $z = -1.65$ ; test statistic:  $z = -1.75$ ; reject  $H_0$
- 9.89**  $H_0: p = .67$ ;  $H_1: p > .67$ ; critical value:  $z = 2.05$ ; test statistic:  $z = 3.15$ ; reject  $H_0$ ;  $p\text{-value} = .0009$ ; for  $\alpha = .02$ , reject  $H_0$
- 9.91**  $H_0: p = .231$ ;  $H_1: p > .231$ ; critical value:  $z = 1.65$ ; test statistic:  $z = .97$ ; do not reject  $H_0$ ;  $p\text{ value} = .1660$ ; for  $\alpha = .05$ , do not reject  $H_0$
- 9.93** a.  $H_0: p \geq .35$ ;  $H_1: p < .35$ ; critical value:  $z = -1.96$ ; test statistic:  $z = -2.94$ ; reject  $H_0$     b. do not reject  $H_0$   
c.  $\alpha = .025$ ;  $p\text{ value} = .0016$ ; reject  $H_0$
- 9.95** a. critical value:  $z = 1.96$ ; test statistic:  $z = 2.27$ ; reject  $H_0$ ; adjust machine    b. critical value:  $z = 2.33$ ; test statistic:  $z = 2.27$ ; do not reject  $H_0$ ; do not adjust the machine
- 9.99** a. critical value:  $z = 1.96$ ; test statistic:  $z = 2.10$ ; reject  $H_0$     b.  $P(\text{Type I error}) = .025$   
c.  $p\text{-value} = .0179$ ; do not reject  $H_0$  if  $\alpha = .01$ ; reject  $H_0$  if  $\alpha = .05$
- 9.101** a. critical values:  $z = -2.33$  and  $2.33$ ; test statistic:  $z = 2.55$ ; reject  $H_0$     b.  $P(\text{Type I error}) = .02$   
c.  $p\text{-value} = .0108$ ; reject  $H_0$  if  $\alpha = .025$ ; do not reject  $H_0$  if  $\alpha = .005$
- 9.103** a.  $H_0: \mu = 67.2$  minutes;  $H_1: \mu > 67.2$  minutes; test statistic:  $z = 4.98$ ;  $p\text{ value} < .0002$ ; if  $\alpha = .05$ , reject  $H_0$   
b. critical value:  $z = 2.33$ ; test statistic:  $z = 4.98$ ; reject  $H_0$
- 9.105** a.  $H_0: \mu \geq 50$ ;  $H_1: \mu < 50$ ; critical value of  $z = -1.96$ ; test statistic:  $z = -3.00$ ; reject  $H_0$   
b.  $P(\text{Type I error}) = .025$     c. do not reject  $H_0$   
d.  $p\text{-value} = .0013$ ; for  $\alpha = .025$ , reject  $H_0$
- 9.107** a.  $H_0: \mu \leq 2400$  square feet;  $H_1: \mu > 2400$  square feet; critical value:  $t = 1.677$ ; test statistic:  $t = 2.097$ ; reject  $H_0$   
b. for  $\alpha = .01$  critical value:  $t = 2.405$ ; test statistic:  $t = 2.097$ ; do not reject  $H_0$
- 9.109**  $H_0: \mu \leq 15$  minutes;  $H_1: \mu > 15$  minutes; critical value:  $t = 2.438$ ; test statistic:  $t = 1.875$ ; do not reject  $H_0$
- 9.111**  $H_0: \mu = 25$  minutes;  $H_1: \mu \neq 25$  minutes; critical values:  $t = -2.947$  and  $2.947$ ; test statistic:  $t = 2.083$ ; do not reject  $H_0$
- 9.113** a.  $H_0: \mu \leq 2$  hours;  $H_1: \mu > 2$  hours; critical value:  $t = 2.718$ ; test statistic:  $t = 1.679$ ; do not reject  $H_0$
- 9.115** a.  $H_0: p = .5$ ;  $H_1: p \neq .5$ ; critical values:  $z = -1.96$  and  $1.96$ ; test statistic:  $z = 1.52$ ; do not reject  $H_0$   
b.  $P(\text{Type I error}) = .05$     c.  $\alpha = .05$ ;  $p\text{-value} = .1286$ ; do not reject  $H_0$
- 9.117**  $H_0: p = .40$ ;  $H_1: p \neq .40$ ; critical values:  $z = -2.58$  and  $2.58$ ; test statistic:  $z = -1.62$ ; do not reject  $H_0$ ;  $p\text{-value} = .1052$ ; do not reject  $H_0$
- 9.119** a.  $H_0: p = .80$ ;  $H_1: p < .80$ ; critical value:  $z = -2.33$ ; test statistic:  $z = -.79$ ; do not reject  $H_0$   
b. do not reject  $H_0$
- 9.121** a.  $.0238$     b.  $\alpha = .0238$
- 9.123**  $\alpha = .3446$
- 9.125**  $H_0: \mu = 750$  hours;  $H_1: \mu < 750$  hours; reject  $H_0$  if  $\bar{x} < 735$ :  $\alpha = .0082$ ; reject  $H_0$  if  $\bar{x} < 700$ :  $\alpha = .0000$
- 9.129** a. 29 or more, or 11 or less    b. 226 or more, or 174 or less    c. 2081 or more, or 1919 or less

### Self-Review Test

1. a    2. b    3. a    4. b    5. a    6. a  
7. a    8. b    9. c    10. a    11. c    12. b  
13. c    14. a    15. b
- 16.** a.  $H_0: \mu = 90.25$  ozs;  $H_1: \mu \neq 90.25$  ozs; critical values:  $z = -2.58$  and  $2.58$ ; test statistic:  $z = -3.18$ ; reject  $H_0$   
b.  $H_0: \mu = 90.25$  ozs;  $H_1: \mu > 90.25$  ozs; critical value:  $z = -1.96$ ; test statistic:  $z = -3.18$ ; reject  $H_0$     c. in part a,  $\alpha = .01$ ; in part b,  $\alpha = .025$     d.  $p\text{-value} = .0014$ , reject  $H_0$     e.  $p\text{-value} = .0007$ , reject  $H_0$
- 17.** a.  $H_0: \mu = 185$ ;  $H_1: \mu < 185$ ; critical value:  $t = -2.438$  test statistic:  $t = -3.000$ ; reject  $H_0$     b.  $P(\text{Type I error}) = .01$     c. do not reject  $H_0$     d.  $.001 < p\text{-value} < .005$ ; for  $\alpha = .01$ , reject  $H_0$
- 18.** a.  $H_0: \mu \geq 31$  months;  $H_1: \mu < 31$  months; critical value:  $t = -2.131$ ; test statistic:  $t = -3.333$ ; reject  $H_0$   
b.  $P(\text{Type I error}) = .025$     c. critical value:  $t = -3.733$ ; do not reject  $H_0$
- 19.** a.  $H_0: p = .5$ ;  $H_1: p < .5$ ; critical value:  $z = -1.65$ ; test statistic:  $z = -3.16$ ; reject  $H_0$     b.  $P(\text{Type I error}) = .05$   
c. do not reject  $H_0$     d.  $p\text{-value} = .0008$ ; reject  $H_0$  if  $\alpha = .05$ ; reject  $H_0$  if  $\alpha = .01$

### Chapter 10

- 10.3** a. 1.83;    b.  $-.72$  to  $4.38$ ; margin of error =  $\pm 2.55$
- 10.5**  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 \neq 0$ ; critical values:  $z = -1.96$  and  $1.96$ ; test statistic:  $z = 1.85$ ; do not reject  $H_0$
- 10.7**  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 < 0$ ; critical value:  $z = -1.65$ ; test statistic:  $z = -1.47$ ; do not reject  $H_0$
- 10.9** a. 9 hours    b. 1.65 to 16.35 hours;    c.  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 \neq 0$ ; critical values:  $z = -2.33$

**AN8** Answers to Selected Odd-Numbered Exercises and Self-Review Tests

- and 2.33; test statistic:  $z = 2.66$ ; reject  $H_0$ ;  $p$ -value = .0078; for  $\alpha = .02$ , reject  $H_0$
- 10.11** a. .74    b. .373 to 1.11    c.  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 > 0$ ; critical value: 2.33; test statistic:  $z = 3.95$ ; reject  $H_0$ ;  $p$  value = .0000; for  $\alpha = .01$ , reject  $H_0$
- 10.13** a.  $-\$1024.54$  to  $-\$75.46$     b.  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 \neq 0$ ; critical values:  $z = -2.58$  and  $2.58$ ; test statistic:  $z = -2.99$ ; reject  $H_0$     c. do not reject  $H_0$
- 10.15** a.  $-6.87$  to  $.87$  calories    b.  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 < 0$ ; critical value:  $z = -2.58$ ; test statistic:  $z = -1.81$ ; do not reject  $H_0$     c.  $p$  value = .0351; do not reject  $H_0$  for  $\alpha = .005$ ; do not reject  $H_0$  for  $\alpha = .025$
- 10.17** a.  $-1.58$     b.  $-3.82$  to  $.66$
- 10.19**  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 \neq 0$ ; critical values:  $t = -2.023$  and  $2.023$ ; test statistic  $t = -1.430$ ; do not reject  $H_0$
- 10.21**  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 < 0$ ; critical value:  $t = -2.426$ ; test statistic:  $t = -1.430$ ; do not reject  $H_0$
- 10.23** a. 2.62    b.  $-5.85$  to  $11.09$     c.  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 > 0$ ; critical value:  $t = 2.500$ ; test statistic:  $t = .77$ ; do not reject  $H_0$
- 10.25** a.  $-46.80$  to  $-7.20$  miles;    b.  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 < 0$ ; critical value:  $t = -2.326$ ; test statistic:  $t = -2.67$ ; reject  $H_0$
- 10.27** a. 2.29 to 5.71 mph    b.  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 > 0$ ; critical value:  $t = 2.416$ ; test statistic:  $t = 5.658$ ; reject  $H_0$
- 10.29** a.  $-12.95$  to  $2.95$  minutes    b.  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 < 0$ ; critical value:  $t = -2.412$ ; test statistic:  $t = -1.691$ ; do not reject  $H_0$
- 10.31** a.  $-.61$  to  $-.39$     b.  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 \neq 0$ ; critical values:  $t = -2.576$  and  $2.576$ ; test statistic:  $t = -10.130$ ; reject  $H_0$
- 10.33**  $-7.86$  to  $-1.04$
- 10.35**  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 \neq 0$ ; critical values:  $t = -2.101$  and  $2.101$ ; test statistic:  $t = -2.740$ ; do not reject  $H_0$
- 10.37**  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 < 0$ ; critical value:  $t = -2.552$ ; test statistic:  $t = -2.740$ ; reject  $H_0$
- 10.39** a.  $-47.01$  to  $-6.99$  miles;    b.  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 < 0$ ; critical value:  $t = -2.326$ ; test statistic:  $t = -2.64$ ; reject  $H_0$     c.  $-48.30$  to  $-5.70$ ; critical value:  $t = -2.397$ ; test statistic:  $t = -2.54$ ; reject  $H_0$
- 10.41** a. 2.23 to 5.77 mph    b.  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 > 0$ ; critical value:  $t = 2.445$ ; test statistic:  $t = 5.513$ ; reject  $H_0$     c. 1.81 to 6.20 mph; critical value:  $t = 2.492$ ; test statistic:  $t = 4.541$ ; reject  $H_0$
- 10.43** a.  $-12.86$  to  $2.86$  minutes    b.  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 < 0$ ; critical value:  $t = -2.414$ ; test statistic:  $t = -1.713$ ; do not reject  $H_0$     c.  $-13.34$  to  $3.34$  minutes; critical value:  $t = -2.431$ ; test statistic:  $t = -1.63$ ; do not reject  $H_0$
- 10.45** a.  $-.61$  to  $-.39$     b.  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 \neq 0$ ; critical values:  $t = -2.576$  and  $2.576$ ; test statistic:  $t = -10.162$ ; reject  $H_0$     c.  $-.62$  to  $-.38$ ; critical values:  $t = -2.576$  and  $2.576$ ; test statistic:  $t = -10.10$ ; reject  $H_0$
- 10.49** a. 11.85 to 23.15    b. 50.08 to 61.72;    c. 25.66 to 32.94
- 10.51** a. critical values:  $t = -2.060$  and  $2.060$ ; test statistic:  $t = 12.551$ ; reject  $H_0$     b. critical value:  $t = 2.624$ ; test statistic:  $t = 7.252$ ; reject  $H_0$     c. critical value:  $t = -1.328$ ; test statistic:  $t = -14.389$ ; reject  $H_0$
- 10.53** a.  $-2.98$  to  $9.84$  minutes    b.  $H_0: \mu_d = 0$ ;  $H_1: \mu_d > 0$ ; critical value:  $t = 2.447$ ; test statistic:  $t = 1.983$ ; do not reject  $H_0$
- 10.55** a. 13.22 to 30.01 seconds    b.  $H_0: \mu_d < +15$ ;  $H_1: \mu_d + 15$ ; critical value:  $t = 1.356$ ; test statistic:  $t = 1.72$ , reject  $H_0$
- 10.57** a.  $-1.02$  to  $1.52$     b.  $H_0: \mu_d = 0$ ;  $H_1: \mu_d \neq 0$ ; critical values:  $t = -2.093$  and  $2.093$ ; test statistic:  $t = .4122$ ; do not reject  $H_0$
- 10.61**  $-.062$  to  $.142$
- 10.63**  $H_0: p_1 - p_2 = 0$ ;  $H_1: p_1 - p_2 \neq 0$ ; critical values:  $z = -1.96$  and  $1.96$ ; test statistic:  $z = .76$ ; do not reject  $H_0$
- 10.65**  $H_0: p_1 - p_2 = 0$ ;  $H_1: p_1 - p_2 > 0$ ; critical value:  $z = 2.05$ ; test statistic:  $z = .76$ ; do not reject  $H_0$
- 10.67** a.  $-.04$     b.  $-.086$  to  $.006$     c. rejection region to the left of  $z = -2.33$ ; non-rejection region to the right of  $z = -2.33$     d. test statistic:  $z = -2.02$     e. do not reject  $H_0$
- 10.69** a.  $-.025$  to  $.225$     b.  $H_0: p_1 - p_2 = 0$ ;  $H_1: p_1 - p_2 < 0$ ; critical values:  $z = 1.96$  and  $-1.96$ ; test statistic:  $z = 1.56$ ; do not reject  $H_0$ ;  $p$  value = .1188; for  $\alpha = .025$ , do not reject  $H_0$     c. .012 to .188; critical values:  $z = -1.96$  and  $1.96$ ; test statistic:  $z = 2.20$ ; reject  $H_0$ ;  $p$  value = .0278; for  $\alpha = .05$ , reject  $H_0$
- 10.71** a. .024    b.  $-.020$  to  $.068$     c.  $H_0: p_1 - p_2 = 0$ ;  $H_1: p_1 - p_2 \neq 0$ ; critical values:  $z = -1.96$  and  $1.96$ ; test statistic:  $z = 1.09$ ; do not reject  $H_0$ ;  $p$ -value = .2758; for  $\alpha = .05$ , do not reject  $H_0$
- 10.73** a. .10    b. .018 to .182    c.  $H_0: p_1 - p_2 = 0$ ;  $H_1: p_1 - p_2 \neq 0$ ; critical values:  $z = -2.58$  and  $2.58$ ; test statistic:  $z = 3.04$ ; reject  $H_0$
- 10.75** a.  $-.013$  to  $.093$     b.  $H_0: p_1 - p_2 = 0$ ;  $H_1: p_1 - p_2 > 0$ ; critical value:  $z = 2.33$  test statistic:  $z = 1.75$ ; do not reject  $H_0$
- 10.77** a.  $-\$119.16$  to  $-\$114.84$     b.  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 < 0$ ; critical value:  $z = -1.96$ ; test statistic:  $z = -106.25$ ; reject  $H_0$
- 10.79** a.  $-.086$  to  $.160$  fatalities    b.  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 > 0$ ; critical value:  $t = 2.326$ ; test statistic:  $t = .70$ ; do not reject  $H_0$
- 10.81** a.  $-8.42$  to  $-1.82$  cards    b.  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 \neq 0$ ; critical values:  $t = -1.645$  and  $1.645$ ; test statistic:  $t = -3.04$ ; reject  $H_0$
- 10.83** a.  $-.085$  to  $.159$  fatalities;  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 > 0$ ; critical value:  $t = 2.326$ ; test statistic:  $t = .71$ ; do not reject  $H_0$     b.  $-.076$  to  $.150$  fatalities;  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 > 0$ ; critical value:  $t = 2.326$ ; test statistic:  $t = .76$ ; do not reject  $H_0$
- 10.85** a.  $-8.35$  to  $-1.89$  cards;  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 \neq 0$ ; critical value:  $t = -1.645$  and  $1.645$ ; test statistic:  $t = -3.11$ ; reject  $H_0$     b.  $-8.55$  to  $-1.69$  cards;  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1: \mu_1 - \mu_2 \neq 0$ ; critical values:  $t = -1.645$  and  $1.645$ ; test statistic:  $t = -2.93$ ; reject  $H_0$
- 10.87** a.  $-9.54$  to  $-.24$     b.  $H_0: \mu_d = 0$ ;  $H_1: \mu_d < 0$ ; critical value:  $t = -2.896$ ; test statistic:  $t = -2.425$ ; do not reject  $H_0$
- 10.89** a. Ind-Rep:  $-.106$  to  $.046$ ; Ind-Dem:  $.080$  to  $.220$ ; Rep-Dem:  $.103$  to  $.257$     b.  $H_0: p_1 - p_2 = 0$ ;  $H_1: p_1 - p_2 \neq 0$ ; critical values:  $z = -2.58$  and  $2.58$ ; test statistic:  $z = -.77$ ; do not reject  $H_0$     c.  $p$  value = .4412; for  $\alpha = .01$ , do not reject  $H_0$

- 10.91** a.  $-.142$  to  $-.018$     b.  $H_0: p_1 - p_2 = 0$ ;  
 $H_1: p_1 - p_2 \neq 0$ ; critical values:  $z = -1.96$  and  $z = 1.96$ ;  
test statistic:  $z = -2.11$ ; reject  $H_0$
- 10.93** .2611
- 10.95**  $n = 9$
- 10.97** a.  $n = 545$     b. .8708
- 10.101** a. .3564    b. .0793    c. .0013

### Self-Review Test

1. a
3. a. 1.62 to 2.78    b.  $H_0: \mu_1 - \mu_2 = 0$ ;  $H_1$ :  
 $\mu_1 - \mu_2 > 0$ ; critical value:  $z = 1.96$ ; test statistic:  
 $z = 9.86$ ; reject  $H_0$
4. a.  $-2.72$  to  $-1.88$  hours    b.  $H_0: \mu_1 - \mu_2 = 0$ ;  
 $H_1: \mu_1 - \mu_2 < 0$ ; critical value:  $t = -2.416$ ; test statistic:  
 $t = -10.997$ ; reject  $H_0$
5. a.  $-2.70$  to  $-1.90$  hours    b.  $H_0: \mu_1 - \mu_2 = 0$ ;  
 $H_1: \mu_1 - \mu_2 < 0$ ; critical value:  $t = -2.421$ ; test statistic:  
 $t = -11.474$ ; reject  $H_0$
6. a.  $-\$53.60$  to  $\$186.18$     b.  $H_0: \mu_d = 0$ ;  $H_1: \mu_d \neq 0$ ;  
critical values:  $t = -2.447$  and  $2.447$ ; test statistic:  
 $t = 2.050$ ; do not reject  $H_0$
7. a.  $-.052$  to  $.092$     b.  $H_0: p_1 - p_2 = 0$ ;  
 $H_1: p_1 - p_2 \neq 0$ ; critical values:  $z = -2.58$  and  $2.58$ ;  
test statistic:  $z = .60$ ; do not reject  $H_0$

### Chapter 11

- 11.3**  $\chi^2 = 41.337$     **11.5**  $\chi^2 = 41.638$
- 11.7** a.  $\chi^2 = 5.009$     b.  $\chi^2 = 3.565$
- 11.13** critical value:  $\chi^2 = 11.070$ ; test statistic:  $\chi^2 = 5.200$ ; do not reject  $H_0$
- 11.15** critical value:  $\chi^2 = 7.815$ ; test statistic:  $\chi^2 = 45.844$ ; reject  $H_0$
- 11.17** critical value:  $\chi^2 = 13.277$ ; test statistic:  $\chi^2 = 19.328$ ; reject  $H_0$
- 11.19** critical value:  $\chi^2 = 9.488$ ; test statistic:  $\chi^2 = 6.752$ ; do not reject  $H_0$
- 11.21** critical value:  $\chi^2 = 9.348$ ; test statistic:  $\chi^2 = 65.087$ ; reject  $H_0$
- 11.27** a.  $H_0$ : the proportion in each row is the same for all four populations;  
 $H_1$ : the proportion in each row is not the same for all four populations  
c. critical value:  $\chi^2 = 14.449$     d. test statistic:  
 $\chi^2 = 52.451$     e. reject  $H_0$
- 11.29** critical value:  $\chi^2 = 5.024$ ; test statistic:  $\chi^2 = 1.980$ ; do not reject  $H_0$
- 11.31** a. critical value:  $\chi^2 = 6.635$ ; test statistic:  $\chi^2 = 8.647$ ; reject  $H_0$     b. critical value:  $\chi^2 = 6.635$ ; test statistic:  
 $\chi^2 = 17.317$ ; reject  $H_0$
- 11.33** critical value:  $\chi^2 = 7.815$ ; test statistic:  $\chi^2 = 2.587$ ; do not reject  $H_0$
- 11.35** critical value:  $\chi^2 = 6.635$ ; test statistic:  $\chi^2 = 8.178$ ; reject  $H_0$
- 11.37** critical value:  $\chi^2 = 7.815$ ; test statistic:  $\chi^2 = 8.221$ ; reject  $H_0$
- 11.39** critical value:  $\chi^2 = 7.378$ ; test statistic:  $\chi^2 = 2.404$ ; do not reject  $H_0$
- 11.41** a. 18.4376 to 84.9686    b. 21.3393 to 67.7365  
c. 23.0674 to 60.6586

- 11.43** a.  $H_0: \sigma^2 = 1.75$ ;  $H_1: \sigma^2 > 1.75$   
b. reject  $H_0$  if  $\chi^2 > 34.170$   
c. test statistic:  $\chi^2 = 22.514$   
d. do not reject  $H_0$
- 11.45** a.  $H_0: \sigma^2 = 2.2$ ;  $H_1: \sigma^2 \neq 2.2$     b. reject  $H_0$  if  
 $\chi^2 < 7.564$  or  $\chi^2 > 30.191$     c. test statistic:  
 $\chi^2 = 35.545$     d. reject  $H_0$
- 11.47** a. .8120 to 3.3160; .9011 to 1.8210    b.  $H_0: \sigma^2 \leq 1.0$ ;  
 $H_1: \sigma^2 > 1.0$ ; critical value:  $\chi^2 = 41.638$ ; test statistic:  
 $\chi^2 = 33.81$ ; do not reject  $H_0$
- 11.49** a. 2739.3051 to 12,623.9126; 52.338 to 112.356  
b.  $H_0: \sigma^2 = 4200$ ;  $H_1: \sigma^2 \neq 4200$ ; critical values:  
 $\chi^2 = 12.401$  and  $39.364$ ; test statistic:  $\chi^2 = 29.714$ ; do not  
reject  $H_0$
- 11.51** critical value:  $\chi^2 = 7.815$ ; test statistic:  $\chi^2 = 10.464$ ;  
reject  $H_0$
- 11.53** critical value:  $\chi^2 = 11.143$ ; test statistic:  $\chi^2 = 22.359$ ;  
reject  $H_0$
- 11.55** critical value:  $\chi^2 = 11.345$ ; test statistic:  $\chi^2 = 15.920$ ;  
reject  $H_0$
- 11.57** critical value:  $\chi^2 = 13.277$ ; test statistic:  $\chi^2 = 50.355$ ;  
reject  $H_0$
- 11.59** critical value:  $\chi^2 = 4.605$ ; test statistic:  $\chi^2 = 13.593$ ;  
reject  $H_0$
- 11.61** critical value:  $\chi^2 = 16.812$ ; test statistic:  $\chi^2 = 10.181$ ; do not reject  $H_0$
- 11.63** a. 3.4064 to 24.0000; 1.846 to 4.899    b. 8.3336 to  
33.2628; 2.887 to 5.767
- 11.65**  $H_0: \sigma^2 = 1.1$ ;  $H_1: \sigma^2 > 1.1$ ; critical value:  $\chi^2 = 28.845$ ;  
test statistic:  $\chi^2 = 24.727$ ; do not reject  $H_0$
- 11.67**  $H_0: \sigma^2 = 10.4$ ;  $H_1: \sigma^2 \neq 10.4$ ; critical values:  $\chi^2 = 7.564$   
and  $30.191$ ; test statistic:  $\chi^2 = 24.192$ ; do not reject  $H_0$
- 11.69** a.  $H_0: \sigma^2 = 5000$ ;  $H_1: \sigma^2 < 5000$ ; critical value:  
 $\chi^2 = 8.907$ ; test statistic:  $\chi^2 = 12.065$ ; do not reject  $H_0$   
b. 1666.8509 to 7903.1835; 40.827 to 88.900
- 11.71** a. .1001 to .4613; .316 to .679    b.  $H_0: \sigma^2 = .13$ ;  $H_1$ :  
 $\sigma^2 \neq .13$ ; critical values:  $\chi^2 = 9.886$  and  $45.559$ ; test  
statistic:  $\chi^2 = 35.077$ ; do not reject  $H_0$
- 11.73** a.  $s^2 = 1840.6964$     b. 804.6509 to 7624.1864;  
28.366 to 87.317    c.  $H_0: \sigma^2 = 750$ ;  $H_1: \sigma^2 \neq 750$ ;  
critical values:  $\chi^2 = 1.690$  and  $16.013$ ; test statistic:  
 $\chi^2 = 17.180$ ; reject  $H_0$
- 11.75** critical value:  $\chi^2 = 5.991$ ; test statistic:  $\chi^2 = 12.931$ ;  
reject  $H_0$
- 11.77** critical value:  $\chi^2 = 9.488$ ; test statistic:  $\chi^2 = 6.857$ ;  
do not reject  $H_0$
- 11.79** critical value:  $\chi^2 = 16.919$ ; test statistic:  $\chi^2 = 215.568$ ;  
reject  $H_0$
- 11.81** a. test statistic:  $\chi^2 = 2.480$ ;  $p$ -value  $> .10$     b. no

### Self-Review Test

1. b    2. a    3. c    4. a    5. b    6. b  
7. c    8. b    9. a
10. critical value:  $\chi^2 = 11.070$ ; test statistic:  $\chi^2 = 20.146$ ; reject  $H_0$
11. critical value:  $\chi^2 = 11.345$ ; test statistic:  $\chi^2 = 31.188$ ; reject  $H_0$
12. critical value:  $\chi^2 = 9.488$ ; test statistic:  $\chi^2 = 82.450$ ; reject  $H_0$
13. a. .2364 to 1.3326; .486 to 1.154    b.  $H_0: \sigma^2 = .25$ ;  
 $H_1: \sigma^2 > .25$ ; critical value:  $\chi^2 = 36.191$ ; test statistic:  
 $\chi^2 = 36.480$ ; reject  $H_0$

## Chapter 12

- 12.3 a. 7.26 b. 5.82 c. 5.27  
 12.5 a. 9.00 b. 2.59 c. 1.79  
 12.7 a. 9.96 b. 6.57 12.9 a. 4.85 b. 3.22  
 12.13 a.  $\bar{x}_1 = 15; \bar{x}_2 = 11; s_1 = 4.50924975; s_2 = 4.39696865$   
 b.  $H_0: \mu_1 = \mu_2; H_1: \mu_1 \neq \mu_2$ ; critical values:  $t = -2.179$   
 and  $2.179$ ; test statistic:  $t = 1.680$ ; do not reject  $H_0$   
 c. critical value:  $F = 4.75$ ; test statistic:  $F = 2.82$ ; do not  
 reject  $H_0$  d. conclusions are the same  
 12.15 b. critical value:  $F = 3.29$ ; test statistic:  $F = 4.07$ ; reject  
 $H_0$   
 12.17 a.  $H_0: \mu_1 = \mu_2 = \mu_3 = \mu_4; H_1$ : all four population means  
 are not equal b. numerator:  $df = 3$ ; denominator:  
 $df = 28$  c.  $SSB = .0105; SSW = 1.1449; SST =$   
 $1.1554$  d. reject  $H_0$  if  $F > 4.58$  e.  $MSB =$   
 $.0035; MSW = .0409$  f. critical value:  $F = 4.58$   
 g. test statistic:  $F = .0856$  i. do not reject  $H_0$   
 12.19 critical value:  $F = 3.55$ ; test statistic:  $F = 2.09$ ; do not  
 reject  $H_0$   
 12.21 critical value:  $F = 3.72$ ; test statistic:  $F = 5.44$ ; reject  $H_0$   
 12.23 a. critical value:  $F = 2.05$ ; test statistic:  $F = 2.12$ ;  
 reject  $H_0$  b. .10  
 12.25 a. critical value:  $F = 6.93$ ; test statistic:  $F = 1.24$ ; do not  
 reject  $H_0$   
 12.27 a. critical value:  $F = 3.89$ ; test statistic:  $F = 4.89$ ; reject  
 $H_0$  b. do not reject  $H_0$   
 12.29 critical value:  $F$  is 5.29; test statistic:  $F = .57$ ; do not  
 reject  $H_0$   
 12.33 a. 5 groups with 10 members each. b. 36 members  
 each.

## Self-Review Test

1. a 2. b 3. c 4. a 5. a  
 6. a 7. b 8. a  
 10. a. critical value:  $F = 3.10$ ; test statistic:  $F = 4.46$ ; reject  $H_0$   
 b. Type I error

## Chapter 13

- 13.15 a. y-intercept = 100; slope = 5; positive relationship  
 b. y-intercept = 400; slope = -4; negative relationship  
 13.17  $\mu_{y|x} = -5.5815 + .2886x$   
 13.19  $\hat{y} = -83.7140 + 10.5714x$   
 13.21 a. \$70.00 b. the same amount  
 c. exact relationship  
 13.23 a. \$27.10 million b. different amounts  
 c. nonexact relationship  
 13.25 b.  $\hat{y} = 322.4483 - 34.4425x$  e. 8135.10  
 f. -\$29,751.72  
 13.27 b.  $\hat{y} = 191.6238 - 25.3714x$  e. 112.9724  
 f. -62.0905  
 13.29 a.  $\mu_{y|x} = 630.6627 + 1.2289x$  b. population  
 regression line because data set includes all 16 National  
 League teams; values of  $A$  and  $B$  d. 734 runs  
 13.35  $\sigma_e = 7.0756; \rho^2 = .04$   
 13.37  $s_e = 4.7117; r^2 = .99$   
 13.39 a.  $SS_{xx} = 64; SS_{yy} = 93636.8889; SS_{xy} = 2283.8$   
 b.  $s_e = 41.6463$  c.  $SST = 93636.8889; SSE =$   
 $12140.9133; SSR = 81495.9756$  d.  $r^2 = .87$

- 13.41 a.  $s_e = 31.2410$  b.  $r^2 = .45$   
 13.43 a.  $s_e = .7832$  b.  $r^2 = .70$   
 13.45 a.  $\sigma_e = 68.1073$  b.  $\rho^2 = .02$   
 13.47 a. 6.01 to 6.63 b.  $H_0: B = 0; H_1: B > 0$ ; critical  
 value:  $t = 2.145$ ; test statistic:  $t = 59.792$ ; reject  $H_0$   
 c.  $H_0: B = 0; H_1: B \neq 0$ ; critical values:  $t = -2.977$   
 and  $2.977$ ; test statistic:  $t = 59.792$ ; reject  $H_0$  d.  $H_0:$   
 $B = 4.50; H_1: B \neq 4.50$ ; critical values:  $t = -2.624$  and  
 $2.624$ ; test statistic:  $t = 17.219$ ; reject  $H_0$   
 13.49 a. 2.35 to 2.65 b.  $H_0: B = 0; H_1: B > 0$ ; critical  
 value:  $t = 1.960$ ; test statistic:  $t = 39.124$ ; reject  $H_0$ ;  
 c.  $H_0: B = 0; H_1: B \neq 0$ ; critical values:  $t = -2.576$   
 and  $2.576$ ; test statistic:  $t = 39.124$ ; reject  $H_0$ ;  
 d.  $H_0: B \leq 1.75; H_1: B > 1.75$ ; critical value:  
 $t = 2.326$ ; test statistic:  $t = 11.737$ ; reject  $H_0$   
 13.51 a. -40.3095 to -28.5756 b.  $H_0: B = 0; H_1: B < 0$ ;  
 critical value:  $t = -1.943$ ; test statistic:  $t = -14.3654$ ;  
 reject  $H_0$   
 13.53 a.  $\hat{y} = 2.4377x + 25.5536$  b. 1.331 to 3.5443  
 c.  $H_0: B = 0; H_1: B > 0$ ; critical value:  $t = 2.365$ ; test  
 statistic:  $t = 6.6042$ ; reject  $H_0$   
 13.55 a. -30.5005 to -20.2424 b.  $H_0: B = 0; H_1: B < 0$ ;  
 critical value:  $t = -2.764$ ; test statistic:  $t = -15.6759$ ;  
 reject  $H_0$   
 13.57 a.  $\hat{y} = 4.4300 + 1.1403x$  b. .7041 to 1.5765  
 c.  $H_0: B = 1.0; H_1: B \neq 1.0$ ; critical values:  $t = -2.228$   
 and  $2.228$ ; test statistic:  $t = .72$ ; do not reject  $H_0$   
 13.63 a. 13.67 a. positive b. positive  
 c. positive d. negative e. zero  
 13.69  $\rho = .21$   
 13.71 a.  $r = -.996$  b.  $H_0: \rho = 0; H_1: \rho < 0$ ; critical  
 value:  $t = -2.764$ ; test statistic:  $t = -35.249$ ; reject  $H_0$   
 13.73 a. positively b.  $r = .93$  c.  $H_0: \rho = 0$ ;  
 $H_1: \rho > 0$ ; critical value:  $t = 1.895$ ; test statistic:  
 $t = 6.694$ ; reject  $H_0$   
 13.75 a. positively b. close to 1 c.  $r = .97$   
 d.  $H_0: \rho = 0; H_1: \rho \neq 0$ ; critical values:  $t = -2.776$  and  
 $2.776$ ; test statistic:  $t = 7.980$ ; reject  $H_0$   
 13.77 a.  $r = .93$  b.  $H_0: \rho = 0; H_1: \rho \neq 0$ ; critical values:  
 $t = -3.499$  and  $3.499$ ; test statistic:  $t = 6.694$ ; reject  $H_0$   
 13.79  $\rho = .16$   
 13.81 a.  $SS_{xx} = 750; SS_{yy} = 2502.6667; SS_{xy} = 710$   
 b.  $\hat{y} = 24.8 + .9467x$  d.  $r = .52; r^2 = .27$   
 f. \$93.91 g.  $s_e = 13.5297$  h.  $-.15$  to  $2.05$   
 i.  $H_0: B = 0; H_1: B > 0$ ; critical value:  $t = 1.812$ ; test  
 statistic:  $t = 1.916$ ; reject  $H_0$  j.  $H_0: \rho = 0; H_1:$   
 $\rho > 0$ ; critical value:  $t = 2.228$ ; test statistic:  
 $t = 1.925$ ; do not reject  $H_0$   
 13.83 a.  $SS_{xx} = 6394.9; SS_{yy} = 1718.9; SS_{xy} = 3136.1$   
 b.  $\hat{y} = -22.5355 + .4904x$  d.  $r = .95; r^2 = .89$   
 e.  $s_e = 4.7557$  f. .291 to .690 g.  $H_0: B = 0$ ;  
 $H_1: B > 0$ ; critical value:  $t = 2.896$ ; test statistic:  $t = 8.246$ ;  
 reject  $H_0$  h.  $H_0: \rho = 0; H_1: \rho \neq 0$ ; critical values:  
 $t = -3.355$  and  $3.355$ ; test statistic:  $t = 8.605$ ; reject  $H_0$   
 13.85 a.  $SS_{xx} = 3.3647; SS_{yy} = 788; SS_{xy} = 49.4$   
 b.  $\hat{y} = 2.8562 + 14.6819x$  d.  $r = .96$ ;  
 $r^2 = .92$  e.  $s_e = 3.5416$  f. 9.718 to 19.646  
 g.  $H_0: B = 0; H_1: B \neq 0$ ; critical values:  
 $t = -4.032$  and  $4.032$ ; test statistic:  $t = 7.6043$ ;  
 reject  $H_0$  h.  $H_0: \rho = 0; H_1: \rho > 0$ ; critical value:  
 $t = 3.365$ ; test statistic:  $t = 7.6665$ ; reject  $H_0$

- 13.87 a. 13.8708 to 16.6292; 11.7648 to 18.7352  
 b. 62.3590 to 67.7210; 56.3623 to 73.7177
- 13.89 \$4611.38 to \$5374.78; \$3808.78 to \$6177.38
- 13.91 \$77.63 to \$95.03; \$54.96 to \$117.71
- 13.93 \$1518.85 to \$2212.88; \$715.60 to \$3016.13
- 13.95 a. positive relationship  
 b.  $\hat{y} = -1.9172 + .9895x$  d.  $r = .97$ ;  $r^2 = .94$   
 e.  $s_e = 1.0941$  f. .54 to 1.44  
 g.  $H_0: B = 0$ ;  $H_1: B > 0$ ; critical value:  $t = 2.571$ ; test statistic:  $t = 8.808$ ; reject  $H_0$  h.  $H_0: \rho = 0$ ;  $H_1: \rho > 0$ ; critical value:  $t = 2.571$ ; test statistic:  $t = 8.922$ ; reject  $H_0$ ; same conclusion
- 13.97 a. positive b.  $\hat{y} = 7.8304 + .5039x$   
 d.  $r = .89$ ;  $r^2 = .79$  e. 2547 f.  $s_e = 3.3525$   
 g. .11 to .90 h.  $H_0: B = 0$ ;  $H_1: B > 0$ ; critical value:  $t = 3.365$ ; test statistic:  $t = 4.278$ ; reject  $H_0$   
 i.  $H_0: \rho = 0$ ;  $H_1: \rho \neq 0$ ; critical values:  $t = -3.365$  and  $3.365$ ; test statistic:  $t = 4.365$ ; reject  $H_0$
- 13.99 a.  $SS_{xx} = 144.32$ ;  $SS_{yy} = 3.02329$ ;  $SS_{xy} = -1.356$   
 b. slightly yes c.  $\hat{y} = -.2133 - .0094x$   
 e.  $r = -.06$  f.  $-.29$
- 13.101 b.  $S_{xx} = 82.5$ ;  $SS_{yy} = .88956$ ;  $SS_{xy} = -3.84$   
 c. yes d.  $\hat{y} = 22.1615 - .0465x$  f.  $r = -.45$   
 g. 21.65 seconds
- 13.103 60.7339 to 97.3729; 40.0144 to 118.0924
- 13.105 1042.7081 to 1153.1345; 953.3648 to 1242.4778
- 13.107 a. yes b. 246.4670 to 275.5330 lines  
 c. 200.0567 to 321.9433 lines e. 338 lines
- 13.111 a. increase b. decrease c. increase  
 d.  $\pm t \cdot s_e \sqrt{\frac{n+1}{n}}$
- 13.113 a.  $r = .92$ ; yes

## Self-Review Test

1. d 2. a 3. b 4. a 5. b 6. b  
 7. true 8. true 9. a 10. b
15. a. The attendance depends on temperature.  
 b. positive d.  $\hat{y} = -2.2269 + .2715x$   
 f.  $r = .65$ ;  $r^2 = .42$  g. 1407 people  
 h.  $s_e = 3.6172$  i.  $-.30$  to  $.84$   
 j.  $H_0: B = 0$ ;  $H_1: B > 0$ ; critical value:  $t = 3.365$ ; test statistic:  $t = 1.904$ ; do not reject  $H_0$   
 k. 1055 to 1758 l. 412 to 2401  
 m.  $H_0: \rho = 0$ ;  $H_1: \rho > 0$ ; critical value:  $t = 3.365$ ; test statistic:  $t = 1.913$ ; do not reject  $H_0$

## Appendix A

- A.7 simple random sample A.9 a. nonrandom sample  
 b. judgment sample c. selection error
- A.11 a. random sample b. simple random sample  
 c. no
- A.13 a. nonrandom sample b. voluntary response error and selection error
- A.15 response error
- A.17 a. designed experiment b. no; would need to know if the women or the doctors who evaluated their health knew which women took aspirin and which were in the control group
- A.19 a. designed experiment b. double-blind study
- A.21 designed experiment A.23 yes
- A.25 b. observational study c. not a double-blind study
- A.27 a. designed experiment b. double-blind study
- A.29 a. no b. no c. convenience sample
- A.33 a. no b. nonresponse error and response error  
 c. above



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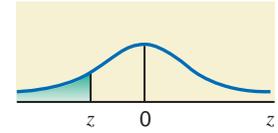






**Table IV Standard Normal Distribution Table**

The entries in this table give the cumulative area under the standard normal curve to the left of  $z$  with the values of  $z$  equal to 0 or negative.

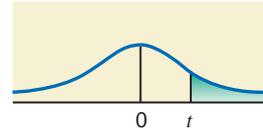


$z$	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
-3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
-3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
-3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
-3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
-3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
-2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
-2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
-2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
-2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
-2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
-2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
-2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
-2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
-2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
-2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
-1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
-1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
-1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
-1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
-1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
-1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
-1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
-1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
-1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
-1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
-0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
-0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
-0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
-0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
-0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
-0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
-0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
-0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
-0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641



**Table V The  $t$  Distribution Table**

The entries in this table give the critical values of  $t$  for the specified number of degrees of freedom and areas in the right tail.



$df$	Area in the Right Tail under the $t$ Distribution Curve					
	.10	.05	.025	.01	.005	.001
1	3.078	6.314	12.706	31.821	63.657	318.309
2	1.886	2.920	4.303	6.965	9.925	22.327
3	1.638	2.353	3.182	4.541	5.841	10.215
4	1.533	2.132	2.776	3.747	4.604	7.173
5	1.476	2.015	2.571	3.365	4.032	5.893
6	1.440	1.943	2.447	3.143	3.707	5.208
7	1.415	1.895	2.365	2.998	3.499	4.785
8	1.397	1.860	2.306	2.896	3.355	4.501
9	1.383	1.833	2.262	2.821	3.250	4.297
10	1.372	1.812	2.228	2.764	3.169	4.144
11	1.363	1.796	2.201	2.718	3.106	4.025
12	1.356	1.782	2.179	2.681	3.055	3.930
13	1.350	1.771	2.160	2.650	3.012	3.852
14	1.345	1.761	2.145	2.624	2.977	3.787
15	1.341	1.753	2.131	2.602	2.947	3.733
16	1.337	1.746	2.120	2.583	2.921	3.686
17	1.333	1.740	2.110	2.567	2.898	3.646
18	1.330	1.734	2.101	2.552	2.878	3.610
19	1.328	1.729	2.093	2.539	2.861	3.579
20	1.325	1.725	2.086	2.528	2.845	3.552
21	1.323	1.721	2.080	2.518	2.831	3.527
22	1.321	1.717	2.074	2.508	2.819	3.505
23	1.319	1.714	2.069	2.500	2.807	3.485
24	1.318	1.711	2.064	2.492	2.797	3.467
25	1.316	1.708	2.060	2.485	2.787	3.450
26	1.315	1.706	2.056	2.479	2.779	3.435
27	1.314	1.703	2.052	2.473	2.771	3.421
28	1.313	1.701	2.048	2.467	2.763	3.408
29	1.311	1.699	2.045	2.462	2.756	3.396
30	1.310	1.697	2.042	2.457	2.750	3.385
31	1.309	1.696	2.040	2.453	2.744	3.375
32	1.309	1.694	2.037	2.449	2.738	3.365
33	1.308	1.692	2.035	2.445	2.733	3.356
34	1.307	1.691	2.032	2.441	2.728	3.348
35	1.306	1.690	2.030	2.438	2.724	3.340

**Table V The *t* Distribution Table (continued)**

<i>df</i>	Area in the Right Tail under the <i>t</i> Distribution Curve					
	.10	.05	.025	.01	.005	.001
36	1.306	1.688	2.028	2.434	2.719	3.333
37	1.305	1.687	2.026	2.431	2.715	3.326
38	1.304	1.686	2.024	2.429	2.712	3.319
39	1.304	1.685	2.023	2.426	2.708	3.313
40	1.303	1.684	2.021	2.423	2.704	3.307
41	1.303	1.683	2.020	2.421	2.701	3.301
42	1.302	1.682	2.018	2.418	2.698	3.296
43	1.302	1.681	2.017	2.416	2.695	3.291
44	1.301	1.680	2.015	2.414	2.692	3.286
45	1.301	1.679	2.014	2.412	2.690	3.281
46	1.300	1.679	2.013	2.410	2.687	3.277
47	1.300	1.678	2.012	2.408	2.685	3.273
48	1.299	1.677	2.011	2.407	2.682	3.269
49	1.299	1.677	2.010	2.405	2.680	3.265
50	1.299	1.676	2.009	2.403	2.678	3.261
51	1.298	1.675	2.008	2.402	2.676	3.258
52	1.298	1.675	2.007	2.400	2.674	3.255
53	1.298	1.674	2.006	2.399	2.672	3.251
54	1.297	1.674	2.005	2.397	2.670	3.248
55	1.297	1.673	2.004	2.396	2.668	3.245
56	1.297	1.673	2.003	2.395	2.667	3.242
57	1.297	1.672	2.002	2.394	2.665	3.239
58	1.296	1.672	2.002	2.392	2.663	3.237
59	1.296	1.671	2.001	2.391	2.662	3.234
60	1.296	1.671	2.000	2.390	2.660	3.232
61	1.296	1.670	2.000	2.389	2.659	3.229
62	1.295	1.670	1.999	2.388	2.657	3.227
63	1.295	1.669	1.998	2.387	2.656	3.225
64	1.295	1.669	1.998	2.386	2.655	3.223
65	1.295	1.669	1.997	2.385	2.654	3.220
66	1.295	1.668	1.997	2.384	2.652	3.218
67	1.294	1.668	1.996	2.383	2.651	3.216
68	1.294	1.668	1.995	2.382	2.650	3.214
69	1.294	1.667	1.995	2.382	2.649	3.213
70	1.294	1.667	1.994	2.381	2.648	3.211
71	1.294	1.667	1.994	2.380	2.647	3.209
72	1.293	1.666	1.993	2.379	2.646	3.207
73	1.293	1.666	1.993	2.379	2.645	3.206
74	1.293	1.666	1.993	2.378	2.644	3.204
75	1.293	1.665	1.992	2.377	2.643	3.202
∞	1.282	1.645	1.960	2.326	2.576	3.090