

UNIVERSITY OF ESWATINI
FACULTY OF SOCIAL SCIENCES
DEPARTMENT OF ECONOMICS
MAIN EXAMINATION
JUNE 2019

TITLE OF PAPER: MATHEMATICS FOR ECONOMISTS II
COURSE CODE: ECO206 / IDE – ECO206
TIME ALLOWED: 2 HOURS
INSTRUCTIONS: ANSWER ANY FOUR QUESTIONS [25 MARKS EACH]

REQUIREMENTS

- SCIENTIFIC CALCULATOR
- STATISTICAL TABLES

DO NOT OPEN THIS PAPER UNTIL YOU HAVE BEEN INSTRUCTED TO DO SO

Question 1

(a) Global Insurance has found that 20% (one in five) of all insurance policies are surrendered (cash in) before their maturity date. Assume that 10 policies are randomly selected from the company's policy database.

i. What is the probability that four of these 10 insurance policies will have been surrendered before their maturity date? [3]

ii. What is the probability that *no more than* three of these 10 insurance policies will have been surrendered before their maturity date? [3]

iii. What is the probability that at *least* two out of the 10 randomly selected policies will be surrendered before their maturity date? [4]

(b) Discuss any two non-probability sampling techniques and any three probability sampling techniques. [15]

Question 2

(a) A survey of a random sample of 300 grocery shoppers in Kimberley found that the mean value of their grocery purchases was R78. Assume that the population standard deviation of grocery purchase values is R21.

Find the 95% confidence limits for the average value of a grocery purchase by all grocery shoppers in Kimberley. [5]

(b) The Grocery Retailers Association of South Africa (GRASA) believes that the average amount spent on groceries by Cape Town shoppers on each visit to a supermarket is R175. To test this belief, the association commissioned Market Research e-Afrika to conduct a survey among a random sample of 360 grocery shoppers at supermarkets in Cape Town.

Based on the survey, the average value of grocery purchases was R182.40. Assume that the population of grocery purchase values is normally distributed with a standard deviation, σ , of R67.50.

Can GRASA conclude that grocery shoppers spend R175, on average, on each visit to a supermarket? Conduct a test at the 5% level of significance. [20]

Question 3

PQ Printers is evaluating the delivery time of two courier delivery services in Johannesburg. Their initial belief is that there is no difference between the average delivery times of the two courier services.

To examine this view, PQ Printers used both courier services daily on a random basis over a period of three months for deliveries to similar destinations. A dispatch clerk in the marketing department recorded *delivery times*. Courier A was used 60 times over this period and the sample mean delivery time was 42 minutes. Courier B was used 48 times over the same period and their sample mean delivery time was 38 minutes. Assume that the population standard deviation of delivery times for courier A is 14 minutes, and for courier B assume it is 10 minutes. Also assume that delivery times are normally distributed.

(a) PQ Printers wishes to sign a one-year contract with one of the courier companies after this trial period. Test the hypothesis, at the 5% level of significance, that there is *no difference* between the mean delivery times of the two couriers. [15]

(b) PQ Printers would like to know whether courier A is *slower*, on average, than courier B in its delivery times to clients. Test statistically, at the 5% level of significance, whether courier A's mean delivery time is *longer than* (i.e. greater than) courier B's mean delivery time. [10]

Question 4

After a recent AIDS awareness campaign, the Department of National Health commissioned a market research company to conduct a survey on its effectiveness. Their brief was to establish whether the *recall rate of teenagers* differed from that of *young adults* (20-30 years of age).

The market research company interviewed a random sample of 640 teenagers and 420 young adults. It was found that 362 teenagers and 260 young adults were able to recall the AIDS awareness slogan of 'AIDS: don't let it happen'.

Test, at the 5% level of significance, the hypothesis that there is an *equal recall rate* between teenagers and young adults (i.e. that the campaign was equally effective for both groups).

[25]

Question 5

(a) A ladies' fashion retail company wants to know whether the proportion of their customers who have store loyalty cards is the same across three major retail outlets: Canal Walk, Sandton Mall and Somerset Mall. A random sample of 180 customers across the three stores was selected and the number who had loyalty cards was recorded.

Table 10.6 Cross-tabulation of loyalty card membership by retail store

Card	Retail outlet location			Total
	Canal Walk	Sandton Mall	Somerset Mall	
Yes	36	44	26	106
No	16	10	18	44
Total	52	54	44	150

Can the management conclude that the *proportion* of loyalty card customers per store is the *same* across the three retail outlets? Test this assertion statistically at the 10% significance level.

[20]

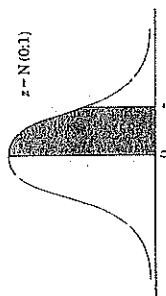
(b) Define a type one and type two error, which error is more fatal?

[5]

APPENDIX 1: LIST OF STATISTICAL TABLES

TABLE 1

The standard normal distribution (z)
This table gives the area under the
standard normal curve between 0 and z
i.e. $P[0 < Z < z]$



z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0518	0.0558	0.0598	0.0638	0.0678	0.0718	0.0758
0.2	0.0798	0.0838	0.0878	0.0918	0.0958	0.0998	0.1038	0.1078	0.1118	0.1158
0.3	0.1198	0.1238	0.1278	0.1318	0.1358	0.1398	0.1438	0.1478	0.1518	0.1558
0.4	0.1598	0.1638	0.1678	0.1718	0.1758	0.1798	0.1838	0.1878	0.1918	0.1958
0.5	0.1998	0.2038	0.2078	0.2118	0.2158	0.2198	0.2238	0.2278	0.2318	0.2358
0.6	0.2398	0.2438	0.2478	0.2518	0.2558	0.2598	0.2638	0.2678	0.2718	0.2758
0.7	0.2798	0.2838	0.2878	0.2918	0.2958	0.2998	0.3038	0.3078	0.3118	0.3158
0.8	0.3198	0.3238	0.3278	0.3318	0.3358	0.3398	0.3438	0.3478	0.3518	0.3558
0.9	0.3598	0.3638	0.3678	0.3718	0.3758	0.3798	0.3838	0.3878	0.3918	0.3958
1.0	0.3998	0.4038	0.4078	0.4118	0.4158	0.4198	0.4238	0.4278	0.4318	0.4358
1.1	0.4398	0.4438	0.4478	0.4518	0.4558	0.4598	0.4638	0.4678	0.4718	0.4758
1.2	0.4798	0.4838	0.4878	0.4918	0.4958	0.4998	0.5038	0.5078	0.5118	0.5158
1.3	0.5198	0.5238	0.5278	0.5318	0.5358	0.5398	0.5438	0.5478	0.5518	0.5558
1.4	0.5598	0.5638	0.5678	0.5718	0.5758	0.5798	0.5838	0.5878	0.5918	0.5958
1.5	0.5998	0.6038	0.6078	0.6118	0.6158	0.6198	0.6238	0.6278	0.6318	0.6358
1.6	0.6398	0.6438	0.6478	0.6518	0.6558	0.6598	0.6638	0.6678	0.6718	0.6758
1.7	0.6798	0.6838	0.6878	0.6918	0.6958	0.6998	0.7038	0.7078	0.7118	0.7158
1.8	0.7198	0.7238	0.7278	0.7318	0.7358	0.7398	0.7438	0.7478	0.7518	0.7558
1.9	0.7598	0.7638	0.7678	0.7718	0.7758	0.7798	0.7838	0.7878	0.7918	0.7958
2.0	0.7998	0.8038	0.8078	0.8118	0.8158	0.8198	0.8238	0.8278	0.8318	0.8358
2.1	0.8398	0.8438	0.8478	0.8518	0.8558	0.8598	0.8638	0.8678	0.8718	0.8758
2.2	0.8798	0.8838	0.8878	0.8918	0.8958	0.8998	0.9038	0.9078	0.9118	0.9158
2.3	0.9198	0.9238	0.9278	0.9318	0.9358	0.9398	0.9438	0.9478	0.9518	0.9558
2.4	0.9598	0.9638	0.9678	0.9718	0.9758	0.9798	0.9838	0.9878	0.9918	0.9958
2.5	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998	0.9998

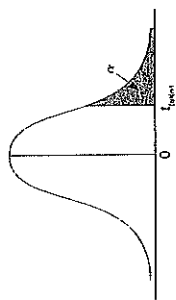


TABLE 2

The t distribution
This table gives the value of $t_{n-1, \alpha}$
where n is the degrees of freedom
i.e. $P[t \geq t_{n-1, \alpha}] = \alpha$

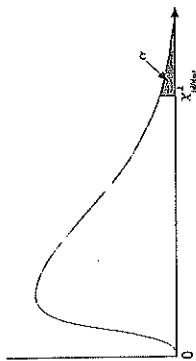
α	0.100	0.050	0.025	0.010	0.005	0.0025	0.001	0.0005
1	1.375	1.638	1.886	2.353	2.706	3.078	3.453	3.747
2	1.061	1.286	1.508	1.886	2.015	2.179	2.353	2.500
3	0.978	1.190	1.385	1.699	1.753	1.833	1.943	2.074
4	0.917	1.134	1.318	1.601	1.646	1.697	1.771	1.856
5	0.874	1.099	1.274	1.533	1.571	1.615	1.676	1.753
6	0.840	1.069	1.240	1.476	1.507	1.545	1.600	1.669
7	0.819	1.048	1.219	1.437	1.469	1.500	1.549	1.613
8	0.801	1.031	1.201	1.408	1.438	1.465	1.510	1.569
9	0.785	1.016	1.186	1.383	1.411	1.438	1.479	1.535
10	0.771	1.002	1.172	1.360	1.387	1.413	1.451	1.505
11	0.759	0.989	1.159	1.339	1.365	1.390	1.425	1.477
12	0.748	0.978	1.148	1.320	1.345	1.370	1.403	1.454
13	0.738	0.968	1.138	1.303	1.327	1.351	1.383	1.433
14	0.729	0.959	1.129	1.287	1.311	1.334	1.365	1.414
15	0.721	0.951	1.121	1.272	1.295	1.318	1.348	1.397
16	0.714	0.944	1.114	1.258	1.281	1.303	1.333	1.381
17	0.707	0.937	1.107	1.245	1.267	1.289	1.318	1.366
18	0.701	0.931	1.101	1.233	1.255	1.276	1.305	1.353
19	0.695	0.925	1.095	1.222	1.243	1.264	1.293	1.340
20	0.690	0.920	1.090	1.212	1.233	1.254	1.282	1.329
21	0.685	0.915	1.085	1.203	1.224	1.245	1.273	1.321
22	0.681	0.911	1.081	1.194	1.215	1.235	1.263	1.314
23	0.677	0.907	1.077	1.186	1.207	1.227	1.255	1.307
24	0.673	0.903	1.073	1.178	1.199	1.219	1.247	1.299
25	0.670	0.900	1.070	1.171	1.191	1.211	1.239	1.292
26	0.667	0.897	1.067	1.164	1.184	1.204	1.232	1.285
27	0.664	0.894	1.064	1.157	1.177	1.197	1.225	1.278
28	0.661	0.891	1.061	1.151	1.171	1.191	1.219	1.271
29	0.659	0.889	1.059	1.145	1.165	1.185	1.213	1.264
30	0.656	0.887	1.056	1.139	1.159	1.179	1.207	1.257
40	0.648	0.880	1.048	1.126	1.146	1.166	1.194	1.246
50	0.643	0.875	1.043	1.116	1.136	1.156	1.184	1.236
60	0.639	0.871	1.039	1.108	1.128	1.148	1.176	1.228
70	0.636	0.868	1.036	1.102	1.122	1.142	1.170	1.222
80	0.634	0.866	1.034	1.097	1.117	1.137	1.165	1.217
90	0.632	0.864	1.032	1.093	1.113	1.133	1.161	1.213
100	0.631	0.863	1.031	1.090	1.110	1.130	1.158	1.210

TABLE 3

The Chi-Squared distribution (χ^2)

This table gives the value of $\chi^2_{df, \alpha}$ where df is the degrees of freedom

i.e. $P[\chi^2 > \chi^2_{df, \alpha}] = \alpha$

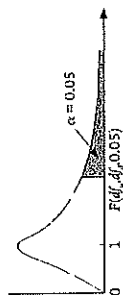


	0.100	0.050	0.025	0.010	0.005	0.0025
1	2.706	3.841	5.024	6.635	7.879	9.488
2	4.605	5.991	7.378	9.210	10.597	12.592
3	6.251	7.879	9.348	11.345	12.838	14.167
4	7.779	9.488	10.591	12.838	14.449	15.985
5	9.236	10.597	11.938	14.449	16.750	17.535
6	10.597	11.938	13.277	15.985	18.548	19.033
7	11.938	13.277	14.568	17.535	20.278	20.483
8	13.277	14.568	15.812	18.885	21.957	21.957
9	14.568	15.812	17.029	20.090	23.589	23.589
10	15.812	17.029	18.168	21.156	25.188	25.188
11	17.029	18.168	19.216	22.179	26.751	26.751
12	18.168	19.216	20.278	23.164	28.289	28.289
13	19.216	20.278	21.263	24.152	29.797	29.797
14	20.278	21.263	22.201	25.151	31.264	31.264
15	21.263	22.201	23.142	26.144	32.695	32.695
16	22.201	23.142	24.064	27.133	34.150	34.150
17	23.142	24.064	24.996	28.119	35.563	35.563
18	24.064	24.996	25.929	29.101	36.937	36.937
19	24.996	25.929	26.854	30.079	38.289	38.289
20	25.929	26.854	27.771	31.053	39.596	39.596
21	26.854	27.771	28.673	32.001	40.831	40.831
22	27.771	28.673	29.564	32.910	42.087	42.087
23	28.673	29.564	30.443	33.801	43.275	43.275
24	29.564	30.443	31.317	34.672	44.414	44.414
25	30.443	31.317	32.187	35.563	45.552	45.552
26	31.317	32.187	33.043	36.441	46.651	46.651
27	32.187	33.043	33.896	37.319	47.701	47.701
28	33.043	33.896	34.746	38.178	48.722	48.722
29	33.896	34.746	35.583	39.002	49.716	49.716
30	34.746	35.583	36.412	39.801	50.689	50.689
31	35.583	36.412	37.233	40.585	51.641	51.641
32	36.412	37.233	38.047	41.337	52.573	52.573
33	37.233	38.047	38.854	42.079	53.486	53.486
34	38.047	38.854	39.654	42.796	54.381	54.381
35	38.854	39.654	40.448	43.487	55.259	55.259
36	39.654	40.448	41.236	44.161	56.113	56.113
37	40.448	41.236	42.019	44.819	56.944	56.944
38	41.236	42.019	42.796	45.461	57.754	57.754
39	42.019	42.796	43.568	46.119	58.544	58.544
40	42.796	43.568	44.334	46.781	59.324	59.324
41	43.568	44.334	45.094	47.429	60.094	60.094
42	44.334	45.094	45.848	48.073	60.844	60.844
43	45.094	45.848	46.597	48.703	61.584	61.584
44	45.848	46.597	47.341	49.329	62.314	62.314
45	46.597	47.341	48.080	49.951	63.034	63.034
46	47.341	48.080	48.814	50.569	63.744	63.744
47	48.080	48.814	49.543	51.183	64.444	64.444
48	48.814	49.543	50.267	51.793	65.134	65.134
49	49.543	50.267	50.986	52.399	65.814	65.814
50	50.267	50.986	51.699	52.991	66.484	66.484

TABLE 4 (a)

F distribution ($\alpha = 0.05$)

The entries in this table are critical values of F for which the area under the curve to the right is equal to 0.05.



Degrees of freedom for denominator	1	2	3	4	5	6	7	8	9	10	15	20	25	30	40	50	60	70	80	90	100
1	161.447	199.500	215.707	224.583	230.169	234.013	237.055	239.499	241.254	242.583	245.912	247.583	248.583	249.583	251.583	252.583	253.583	254.583	255.583	256.583	257.583
2	18.513	18.000	17.591	17.259	16.977	16.733	16.525	16.350	16.207	16.083	15.833	15.633	15.483	15.350	15.150	15.000	14.850	14.700	14.550	14.400	14.250
3	10.128	9.552	9.148	8.818	8.539	8.297	8.093	7.921	7.779	7.656	7.406	7.206	7.056	6.923	6.723	6.573	6.423	6.273	6.123	5.973	5.823
4	7.709	7.115	6.713	6.385	6.108	5.868	5.666	5.495	5.354	5.231	4.981	4.781	4.631	4.500	4.300	4.150	4.000	3.850	3.700	3.550	3.400
5	6.591	5.998	5.598	5.271	4.996	4.757	4.556	4.386	4.245	4.123	3.873	3.673	3.523	3.392	3.192	3.042	2.892	2.742	2.592	2.442	2.292
6	5.965	5.373	4.974	4.648	4.374	4.136	3.936	3.767	3.626	3.504	3.254	3.054	2.904	2.773	2.573	2.423	2.273	2.123	1.973	1.823	1.673
7	5.591	5.000	4.602	4.277	4.003	3.766	3.567	3.398	3.257	3.135	2.885	2.685	2.535	2.404	2.204	2.054	1.904	1.754	1.604	1.454	1.304
8	5.318	4.728	4.331	4.006	3.732	3.496	3.297	3.128	2.987	2.865	2.615	2.415	2.265	2.134	1.934	1.784	1.634	1.484	1.334	1.184	1.034
9	5.101	4.512	4.115	3.790	3.516	3.280	3.081	2.912	2.771	2.649	2.399	2.199	2.049	1.918	1.718	1.568	1.418	1.268	1.118	0.968	0.818
10	4.925	4.336	3.939	3.614	3.340	3.104	2.905	2.736	2.595	2.473	2.223	2.023	1.873	1.742	1.542	1.392	1.242	1.092	0.942	0.792	0.642
15	4.454	3.865	3.468	3.143	2.869	2.633	2.434	2.265	2.124	2.002	1.752	1.552	1.402	1.271	1.071	0.921	0.771	0.621	0.471	0.321	0.171
20	4.193	3.604	3.207	2.882	2.608	2.372	2.173	2.004	1.863	1.741	1.491	1.291	1.141	1.010	0.810	0.660	0.510	0.360	0.210	0.060	
25	4.054	3.465	3.068	2.743	2.469	2.233	2.034	1.865	1.724	1.602	1.352	1.152	1.002	0.871	0.671	0.521	0.371	0.221	0.071		
30	3.965	3.376	2.979	2.654	2.380	2.144	1.945	1.776	1.635	1.513	1.263	1.063	0.913	0.782	0.582	0.432	0.282	0.132			
40	3.851	3.262	2.865	2.540	2.266	2.030	1.831	1.662	1.521	1.399	1.149	0.949	0.799	0.668	0.468	0.318	0.168				
50	3.772	3.183	2.786	2.461	2.187	1.951	1.752	1.583	1.442	1.320	1.070	0.870	0.720	0.589	0.389	0.239	0.089				
60	3.718	3.129	2.732	2.407	2.133	1.897	1.698	1.529	1.388	1.266	1.016	0.816	0.666	0.535	0.335	0.185	0.035				
70	3.674	3.085	2.688	2.363	2.089	1.853	1.654	1.485	1.344	1.222	0.972	0.772	0.622	0.491	0.291	0.141					
80	3.639	3.050	2.653	2.328	2.054	1.818	1.619	1.450	1.309	1.187	0.937	0.737	0.587	0.456	0.256	0.106					
90	3.610	3.021	2.624	2.299	2.025	1.789	1.590	1.421	1.280	1.158	0.908	0.708	0.558	0.427	0.227	0.077					
100	3.586	3.000	2.603	2.278	2.004	1.768	1.569	1.400	1.259	1.137	0.887	0.687	0.537	0.406	0.206	0.056					

TABLE 4 (a) continued

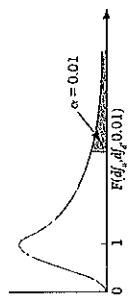
F distribution ($\alpha = 0.05$)

Degrees of freedom for denominator		Degrees of freedom for numerator											
		1	2	3	4	5	6	7	8	9	10	12	15
1		161.44	199.50	215.71	227.17	235.00	241.88	247.99	253.68	259.01	264.04	268.91	273.61
2		18.513	16.000	14.599	13.708	13.122	12.678	12.347	12.095	11.897	11.739	11.601	11.479
3		10.128	8.4514	7.2876	6.5959	6.1032	5.7591	5.5073	5.3170	5.1629	5.0413	4.9453	4.8601
4		7.7086	6.5959	5.7658	5.1714	4.6780	4.3340	4.0822	3.8919	3.7378	3.6162	3.5202	3.4350
5		6.5959	5.4033	4.5732	3.9788	3.4854	3.1414	2.8896	2.6993	2.5452	2.4236	2.3276	2.2424
6		5.9646	4.7720	3.9419	3.3475	2.8541	2.5101	2.2583	2.0680	1.9139	1.7923	1.6963	1.6111
7		5.5914	4.3988	3.5687	2.9743	2.4809	2.1369	1.8851	1.6948	1.5407	1.4191	1.3231	1.2379
8		5.3170	4.1244	3.2943	2.7000	2.2066	1.8626	1.6108	1.4205	1.2664	1.1448	1.0488	0.9636
9		5.1629	3.9703	3.1402	2.5459	2.0525	1.7085	1.4567	1.2664	1.1123	0.9907	0.8947	0.8095
10		5.0413	3.8487	3.0186	2.4243	1.9309	1.5869	1.3351	1.1448	0.9907	0.8691	0.7731	0.6879
12		4.9453	3.7231	2.8930	2.2987	1.8053	1.4613	1.2095	1.0192	0.8651	0.7435	0.6475	0.5623
15		4.8601	3.6345	2.8044	2.2101	1.7167	1.3727	1.1209	0.9306	0.7765	0.6549	0.5589	0.4737

TABLE 4 (b)

F distribution ($\alpha = 0.01$)

The entries in the table are critical values of F for which the area under the curve to the right is equal to 0.01.



Degrees of freedom for denominator		Degrees of freedom for numerator											
		1	2	3	4	5	6	7	8	9	10	12	15
1		161.44	199.50	215.71	227.17	235.00	241.88	247.99	253.68	259.01	264.04	268.91	273.61
2		18.513	16.000	14.599	13.708	13.122	12.678	12.347	12.095	11.897	11.739	11.601	11.479
3		10.128	8.4514	7.2876	6.5959	6.1032	5.7591	5.5073	5.3170	5.1629	5.0413	4.9453	4.8601
4		7.7086	6.5959	5.7658	5.1714	4.6780	4.3340	4.0822	3.8919	3.7378	3.6162	3.5202	3.4350
5		6.5959	5.4033	4.5732	3.9788	3.4854	3.1414	2.8896	2.6993	2.5452	2.4236	2.3276	2.2424
6		5.9646	4.7720	3.9419	3.3475	2.8541	2.5101	2.2583	2.0680	1.9139	1.7923	1.6963	1.6111
7		5.5914	4.3988	3.5687	2.9743	2.4809	2.1369	1.8851	1.6948	1.5407	1.4191	1.3231	1.2379
8		5.3170	4.1244	3.2943	2.7000	2.2066	1.8626	1.6108	1.4205	1.2664	1.1448	1.0488	0.9636
9		5.1629	3.9703	3.1402	2.5459	2.0525	1.7085	1.4567	1.2664	1.1123	0.9907	0.8947	0.8095
10		5.0413	3.8487	3.0186	2.4243	1.9309	1.5869	1.3351	1.1448	0.9907	0.8691	0.7731	0.6879
12		4.9453	3.7231	2.8930	2.2987	1.8053	1.4613	1.2095	1.0192	0.8651	0.7435	0.6475	0.5623
15		4.8601	3.6345	2.8044	2.2101	1.7167	1.3727	1.1209	0.9306	0.7765	0.6549	0.5589	0.4737

TABLE 4 (b) continued
F distribution ($\alpha = 0.01$)

Degrees of freedom for numerator		Degrees of freedom for denominator									
		1	2	3	4	5	6	7	8	9	10
		17.16	15.99	15.00	14.26	13.67	13.19	12.80	12.49	12.24	12.03
1	1	161.44	199.50	215.71	229.01	240.54	250.66	259.64	267.69	274.98	281.63
1	2	16.59	19.00	20.00	20.99	21.90	22.72	23.46	24.13	24.74	25.30
1	3	10.13	11.99	12.59	13.01	13.43	13.76	14.04	14.29	14.51	14.71
1	4	7.71	9.00	9.35	9.60	9.80	10.00	10.17	10.32	10.46	10.59
1	5	6.58	7.59	7.88	8.08	8.24	8.38	8.51	8.63	8.74	8.85
1	6	5.96	6.79	7.03	7.20	7.34	7.46	7.57	7.67	7.76	7.85
1	7	5.59	6.34	6.54	6.69	6.81	6.92	7.02	7.11	7.19	7.27
1	8	5.34	6.01	6.18	6.32	6.43	6.53	6.62	6.70	6.78	6.85
1	9	5.16	5.75	5.90	6.03	6.13	6.23	6.31	6.39	6.46	6.53
1	10	5.04	5.55	5.68	5.80	5.90	5.99	6.07	6.14	6.21	6.27
2	1	199.50	191.16	184.26	178.47	173.64	169.44	165.75	162.44	159.49	156.87
2	2	18.51	17.16	16.59	16.00	15.49	15.00	14.57	14.19	13.85	13.54
2	3	13.92	12.93	12.59	12.26	11.94	11.63	11.34	11.06	10.80	10.56
2	4	11.69	10.71	10.35	10.02	9.70	9.40	9.12	8.86	8.62	8.40
2	5	10.59	9.61	9.24	8.91	8.59	8.29	8.01	7.75	7.51	7.29
2	6	9.78	8.80	8.43	8.10	7.78	7.48	7.20	6.94	6.70	6.48
2	7	9.15	8.17	7.80	7.47	7.15	6.85	6.57	6.31	6.07	5.85
2	8	8.64	7.66	7.29	6.96	6.64	6.34	6.06	5.80	5.56	5.34
2	9	8.21	7.23	6.86	6.53	6.21	5.91	5.63	5.37	5.13	4.91
2	10	7.85	6.87	6.50	6.17	5.85	5.55	5.27	5.01	4.77	4.55
3	1	215.71	206.91	200.00	194.44	189.76	185.61	181.94	178.64	175.69	173.07
3	2	19.16	17.71	17.14	16.55	16.04	15.55	15.12	14.74	14.40	14.09
3	3	14.26	13.27	12.93	12.60	12.28	11.97	11.68	11.41	11.16	10.93
3	4	12.59	11.61	11.25	10.92	10.60	10.29	10.01	9.75	9.51	9.29
3	5	11.44	10.46	10.10	9.77	9.45	9.15	8.87	8.61	8.37	8.15
3	6	10.54	9.56	9.20	8.87	8.55	8.25	7.97	7.71	7.47	7.25
3	7	9.91	8.93	8.57	8.24	7.92	7.62	7.34	7.08	6.84	6.62
3	8	9.40	8.42	8.06	7.73	7.41	7.11	6.83	6.57	6.33	6.11
3	9	8.98	8.00	7.64	7.31	6.99	6.69	6.41	6.15	5.91	5.69
3	10	8.62	7.64	7.28	6.95	6.63	6.33	6.05	5.79	5.55	5.33
4	1	229.01	220.00	213.00	207.44	202.76	198.61	194.94	191.64	188.69	186.07
4	2	19.99	18.54	17.97	17.38	16.87	16.38	15.95	15.57	15.23	14.92
4	3	15.00	14.01	13.67	13.34	13.02	12.71	12.42	12.15	11.90	11.67
4	4	13.26	12.28	11.94	11.61	11.29	10.98	10.69	10.43	10.18	9.95
4	5	12.03	11.05	10.71	10.38	10.06	9.76	9.47	9.21	8.96	8.73
4	6	11.14	10.16	9.82	9.49	9.17	8.87	8.59	8.33	8.09	7.87
4	7	10.51	9.53	9.19	8.86	8.54	8.24	7.96	7.70	7.46	7.24
4	8	10.00	9.02	8.68	8.35	8.03	7.73	7.45	7.19	6.95	6.73
4	9	9.58	8.60	8.26	7.93	7.61	7.31	7.03	6.77	6.53	6.31
4	10	9.24	8.26	7.92	7.59	7.27	6.97	6.69	6.43	6.19	5.97
5	1	240.54	231.53	224.53	218.97	214.29	209.94	206.09	202.44	199.14	196.31
5	2	20.00	18.55	17.98	17.39	16.88	16.39	15.96	15.58	15.24	14.93
5	3	15.00	14.01	13.67	13.34	13.02	12.71	12.42	12.15	11.90	11.67
5	4	13.67	12.69	12.35	12.02	11.70	11.39	11.10	10.84	10.59	10.35
5	5	12.49	11.51	11.17	10.84	10.52	10.21	9.92	9.66	9.41	9.18
5	6	11.63	10.65	10.31	9.98	9.66	9.36	9.07	8.81	8.57	8.34
5	7	11.00	10.02	9.68	9.35	9.03	8.73	8.45	8.19	7.95	7.73
5	8	10.49	9.51	9.17	8.84	8.52	8.22	7.94	7.68	7.44	7.22
5	9	10.07	9.09	8.75	8.42	8.10	7.80	7.52	7.26	7.02	6.80
5	10	9.73	8.75	8.41	8.08	7.76	7.46	7.18	6.92	6.68	6.46
6	1	250.66	241.65	234.65	229.09	224.41	219.94	216.09	212.44	209.14	206.31
6	2	20.59	19.14	18.57	17.98	17.47	16.98	16.55	16.17	15.83	15.52
6	3	15.00	14.01	13.67	13.34	13.02	12.71	12.42	12.15	11.90	11.67
6	4	13.76	12.78	12.44	12.11	11.79	11.48	11.19	10.93	10.68	10.44
6	5	12.67	11.69	11.35	11.02	10.70	10.39	10.10	9.84	9.59	9.35
6	6	11.81	10.83	10.49	10.16	9.84	9.54	9.25	8.99	8.75	8.52
6	7	11.18	10.20	9.86	9.53	9.21	8.91	8.63	8.37	8.13	7.91
6	8	10.67	9.69	9.35	9.02	8.70	8.40	8.12	7.86	7.62	7.40
6	9	10.25	9.27	8.93	8.60	8.28	7.98	7.70	7.44	7.20	6.98
6	10	9.91	8.93	8.59	8.26	7.94	7.64	7.36	7.10	6.86	6.64
7	1	259.64	250.63	243.63	238.07	233.39	228.94	224.79	220.94	217.44	214.31
7	2	21.18	19.73	19.16	18.57	18.06	17.57	17.14	16.76	16.42	16.11
7	3	15.00	14.01	13.67	13.34	13.02	12.71	12.42	12.15	11.90	11.67
7	4	13.92	12.94	12.60	12.27	11.95	11.64	11.35	11.09	10.84	10.60
7	5	12.80	11.82	11.48	11.15	10.83	10.52	10.23	9.97	9.72	9.48
7	6	12.03	11.05	10.71	10.38	10.06	9.76	9.47	9.21	8.96	8.73
7	7	11.40	10.42	10.08	9.75	9.43	9.13	8.85	8.59	8.35	8.13
7	8	10.89	9.91	9.57	9.24	8.92	8.62	8.34	8.08	7.84	7.62
7	9	10.47	9.49	9.15	8.82	8.50	8.20	7.92	7.66	7.42	7.20
7	10	10.13	9.15	8.81	8.48	8.16	7.86	7.58	7.32	7.08	6.86
8	1	267.69	258.68	251.68	246.12	241.44	236.99	232.84	228.99	225.44	222.31
8	2	21.77	20.32	19.75	19.16	18.65	18.16	17.73	17.35	17.01	16.70
8	3	15.00	14.01	13.67	13.34	13.02	12.71	12.42	12.15	11.90	11.67
8	4	14.01	13.03	12.69	12.36	12.04	11.73	11.44	11.18	10.93	10.69
8	5	12.87	11.89	11.55	11.22	10.90	10.59	10.30	10.04	9.79	9.55
8	6	12.10	11.12	10.78	10.45	10.13	9.83	9.54	9.28	9.03	8.80
8	7	11.47	10.49	10.15	9.82	9.50	9.20	8.92	8.66	8.42	8.20
8	8	10.96	9.98	9.64	9.31	8.99	8.69	8.41	8.15	7.91	7.69
8	9	10.54	9.56	9.22	8.89	8.57	8.27	7.99	7.73	7.49	7.27
8	10	10.20	9.22	8.88	8.55	8.23	7.93	7.65	7.39	7.15	6.93
9	1	274.98	265.97	258.97	253.41	248.73	244.28	239.93	235.78	231.93	228.50
9	2	22.36	20.91	20.34	19.75	19.24	18.75	18.32	17.94	17.60	17.29
9	3	15.00	14.01	13.67	13.34	13.02	12.71	12.42	12.15	11.90	11.67
9	4	14.26	13.28	12.94	12.61	12.29	11.98	11.69	11.43	11.18	10.94
9	5	13.19	12.21	11.87	11.54	11.22	10.91	10.62	10.36	10.11	9.87
9	6	12.42	11.44	11.10	10.77	10.45	10.15	9.86	9.60	9.35	9.12
9	7	11.79	10.81	10.47	10.14	9.82	9.52	9.24	8.98	8.74	8.52
9	8	11.28	10.30	9.96	9.63	9.31	9.01	8.73	8.47	8.23	8.01
9	9	10.86	9.88	9.54	9.21	8.89	8.59	8.31	8.05	7.81	7.59
9	10	10.52	9.54	9.20	8.87	8.55	8.25	7.97	7.71	7.47	7.25
10	1	281.63	272.62	265.62	260.06	255.38	250.93	246.58	242.43	238.58	234.93
10	2	22.95	21.50	20.93	20.34	19.83	19.34	18.91	18.53	18.19	17.88
10	3	15.00	14.01	13.67	13.34	13.02	12.71	12.42	12.15	11.90	11.67
10	4	14.57	13.59	13.25	12.92	12.60	12.29	12.00	11.74	11.49	11.25
10	5	13.67	12.69	12.35	12.02	11.70	11.39	11.10	10.84	10.59	10.35
10	6	12.90	11.92	11.58	11.25	10.93	10.63	10.34	10.08	9.83	9.60
10	7	12.27	11.29	10.95	10.62	10.30	10.00	9.71	9.45	9.21	8.98
10	8	11.76	10.78	10.44	10.11	9.79	9.49	9.21	8.95	8.71	8.49
10	9	11.34	10.36	10.02	9.69	9.37	9.07	8.79	8.53	8.29	8.07
10	10	11.00	10.02	9.68	9.35	9.03	8.73	8.45	8.19	7.95	7.73