

CORRESPONDENCE.

ORIGINAL TABLES.

*To the Editors of the Journal of the Institute of Actuaries.*

DEAR SIRS,—Having on several occasions had to estimate the value of functions by the  $O^{[M]}$  Table at 5 per-cent interest, I have prepared a table of annuities on this basis, and, as it may be of some service to other members of the profession, I send you the table referred to herewith.

In constructing this table the ultimate value of  $D_x$  was made up by a continuous process from the relation

$$\log D_{x+1} = \log D_x + \log vp_x$$

the value of  $\log p_x$  being taken from the table published in the official volume to five places. Throughout the whole construction, therefore, five place logarithms only were used.

The value of  $D_{[x]}$  was then constructed—again by five-place logarithms—directly from the value of  $(\log v^x + \log l_{[x]})$  and thereafter the tables of both  $D_{[x]}$  and  $D_{[x]+10}$  were checked at decennial ages by the arithmometer.

From the relation  $\log D_{[x]+n+1} = \log D_{[x]+n} + \log vp_{[x]+n}$  complete tables of  $D_{[x]+n}$  were made up—the values of  $\log D_{[x]+10}$  so found agreeing with the values of  $\log D$  ultimate first obtained.

Having by summation constructed tables of  $N_{[x]}$  and  $N$  and thence constructed—in duplicate by the arithmometer—tables of  $a_{[x]}$ ,  $a_{[x]:\overline{60}}$ ,  $a_{[x]:\overline{40}}$  and  $a_{[x]:\overline{20}}$  to serve as check values: the tables were then completed by the continuous process

$$a_{[x]:\overline{n}} = a_{[x]:\overline{n-1}} + D_{[x]+n} \cdot D_{[x]}^{-1}$$

In using the values of  $\log vp$  the necessary corrections were made to counteract the ignoring of the sixth and seventh places of decimals in the value of  $\log v$ : but as  $\log p$  was, as has been said, taken only to five places of decimals, the resultant annuity-values may differ by one in the third place from values derived from  $\log p$  as tabulated to seven places in the “Account of Principles and Methods.”

I am,

Yours faithfully,

C. KEITH GRANGER.

30, Renfield Street, Glasgow.

16 July 1918.

$0^{[M]}$

$\alpha_{[x]n}$

5 per-cent.

Duration	10	11	12	13	14	15	16	17	18	19	Duration
	16·916	16·863	16·808	16·750	16·689	16·626	16·559	16·490	16·417	16·341	
0	·000	·000	·000	·000	·000	·000	·000	·000	·000	·000	0
1	·950	·950	·950	·950	·950	·950	·950	·950	·950	·950	1
2	1·851	1·851	1·851	1·851	1·851	1·851	1·851	1·851	1·851	1·851	2
3	2·705	2·705	2·705	2·705	2·705	2·705	2·705	2·705	2·705	2·704	3
4	3·515	3·515	3·515	3·514	3·514	3·514	3·514	3·513	3·513	3·513	4
5	4·282	4·281	4·281	4·281	4·281	4·280	4·280	4·280	4·279	4·279	5
6	5·008	5·008	5·007	5·007	5·007	5·006	5·005	5·005	5·004	5·004	6
7	5·696	5·695	5·695	5·694	5·694	5·693	5·692	5·692	5·691	5·690	7
8	6·347	6·346	6·346	6·345	6·344	6·343	6·342	6·341	6·340	6·339	8
9	6·963	6·962	6·961	6·961	6·960	6·958	6·957	6·956	6·955	6·953	9
10	7·546	7·545	7·544	7·543	7·542	7·540	7·539	7·537	7·537	7·534	10
1	8·098	8·097	8·095	8·094	8·092	8·091	8·089	8·087	8·085	8·082	1
2	8·620	8·618	8·617	8·615	8·613	8·611	8·609	8·606	8·604	8·601	2
3	9·113	9·112	9·110	9·108	9·106	9·103	9·100	9·098	9·095	9·091	3
4	9·580	9·578	9·576	9·574	9·571	9·568	9·565	9·562	9·558	9·555	4
15	10·022	10·019	10·017	10·014	10·011	10·008	10·004	10·001	9·997	9·992	15
6	10·439	10·437	10·434	10·431	10·428	10·424	10·420	10·415	10·411	10·406	6
7	10·834	10·831	10·828	10·825	10·821	10·817	10·812	10·807	10·802	10·796	7
8	11·203	11·204	11·201	11·197	11·193	11·188	11·182	11·177	11·171	11·164	8
9	11·561	11·557	11·553	11·548	11·544	11·538	11·532	11·526	11·519	11·512	9
20	11·894	11·890	11·886	11·881	11·876	11·870	11·863	11·856	11·848	11·840	20
1	12·210	12·205	12·200	12·195	12·189	12·182	12·175	12·167	12·159	12·150	1
2	12·508	12·503	12·497	12·491	12·485	12·478	12·470	12·461	12·452	12·442	2
3	12·789	12·784	12·778	12·771	12·764	12·756	12·747	12·738	12·728	12·717	3
4	13·055	13·049	13·043	13·036	13·028	13·019	13·010	12·999	12·988	12·976	4
25	13·307	13·300	13·293	13·285	13·277	13·267	13·257	13·246	13·234	13·220	25
6	13·544	13·537	13·529	13·521	13·511	13·501	13·490	13·478	13·465	13·450	6
7	13·768	13·760	13·752	13·743	13·733	13·722	13·709	13·696	13·682	13·667	7
8	13·980	13·971	13·962	13·952	13·941	13·930	13·916	13·902	13·887	13·870	8
9	14·179	14·170	14·160	14·150	14·138	14·125	14·111	14·096	14·079	14·061	9
30	14·367	14·358	14·347	14·336	14·323	14·309	14·294	14·278	14·260	14·241	30
1	14·545	14·535	14·523	14·511	14·498	14·483	14·466	14·449	14·430	14·409	1
2	14·712	14·701	14·689	14·676	14·662	14·646	14·628	14·610	14·589	14·567	2
3	14·870	14·858	14·845	14·831	14·816	14·799	14·780	14·760	14·739	14·715	3
4	15·018	15·006	14·992	14·977	14·961	14·943	14·923	14·902	14·879	14·854	4
35	15·158	15·145	15·130	15·114	15·097	15·078	15·057	15·034	15·010	14·983	35
6	15·290	15·275	15·260	15·243	15·225	15·204	15·182	15·158	15·132	15·104	6
7	15·413	15·398	15·382	15·364	15·344	15·323	15·299	15·274	15·247	15·217	7
8	15·530	15·514	15·496	15·477	15·457	15·434	15·409	15·382	15·353	15·322	8
9	15·639	15·622	15·603	15·583	15·562	15·538	15·511	15·483	15·453	15·420	9
40	15·741	15·723	15·704	15·683	15·660	15·635	15·607	15·577	15·545	15·510	40
1	15·837	15·818	15·798	15·775	15·751	15·725	15·696	15·665	15·631	15·594	1
2	15·927	15·907	15·886	15·862	15·837	15·809	15·778	15·746	15·710	15·672	2
3	16·011	15·990	15·968	15·943	15·917	15·887	15·855	15·821	15·784	15·744	3
4	16·090	16·068	16·044	16·018	15·991	15·960	15·926	15·890	15·851	15·809	4
45	16·164	16·141	16·116	16·088	16·059	16·027	15·992	15·955	15·914	15·870	45
6	16·232	16·208	16·182	16·154	16·123	16·089	16·053	16·014	15·971	15·925	6
7	16·296	16·271	16·244	16·214	16·182	16·147	16·109	16·068	16·024	15·976	7
8	16·355	16·329	16·301	16·269	16·236	16·200	16·160	16·117	16·071	16·022	8
9	16·411	16·383	16·353	16·321	16·286	16·248	16·207	16·163	16·115	16·064	9
	10	11	12	13	14	15	16	17	18	19	

0<sup>[M]</sup>

$a_{[x]n}$

5 per-cent.

Duration	20	21	22	23	24	25	26	27	28	29	Duration
	16·262	16·179	16·092	16·002	15·907	15·810	15·707	15·601	15·490	15·375	
0	·000	·000	·000	·000	·000	·000	·000	·000	·000	·000	0
1	·950	·950	·950	·950	·950	·950	·950	·950	·950	·949	1
2	1·851	1·850	1·850	1·850	1·850	1·850	1·850	1·850	1·849	1·849	2
3	2·704	2·704	2·704	2·703	2·703	2·703	2·703	2·702	2·702	2·701	3
4	3·513	3·512	3·512	3·511	3·511	3·510	3·510	3·509	3·508	3·508	4
5	4·278	4·278	4·277	4·276	4·276	4·275	4·274	4·273	4·272	4·271	5
6	5·003	5·002	5·001	5·000	4·999	4·998	4·997	4·996	4·994	4·992	6
7	5·689	5·688	5·686	5·685	5·684	5·682	5·680	5·679	5·676	5·674	7
8	6·338	6·336	6·335	6·333	6·331	6·329	6·327	6·324	6·321	6·319	8
9	6·951	6·949	6·947	6·945	6·943	6·940	6·937	6·934	6·930	6·927	9
10	7·531	7·529	7·527	7·524	7·521	7·518	7·514	7·510	7·505	7·501	10
1	8·090	8·077	8·074	8·071	8·067	8·063	8·058	8·054	8·048	8·042	1
2	8·598	8·594	8·591	8·587	8·582	8·578	8·572	8·567	8·560	8·553	2
3	9·088	9·083	9·079	9·074	9·069	9·063	9·057	9·050	9·042	9·035	3
4	9·550	9·545	9·540	9·535	9·528	9·522	9·514	9·507	9·497	9·488	4
15	9·987	9·981	9·976	9·969	9·962	9·954	9·946	9·937	9·926	9·915	15
6	10·400	10·393	10·387	10·379	10·371	10·362	10·352	10·342	10·330	10·318	6
7	10·789	10·782	10·774	10·766	10·756	10·747	10·735	10·724	10·710	10·696	7
8	11·157	11·149	11·140	11·131	11·120	11·109	11·096	11·083	11·068	11·052	8
9	11·504	11·495	11·485	11·475	11·462	11·450	11·436	11·421	11·404	11·386	9
20	11·831	11·821	11·810	11·798	11·785	11·771	11·756	11·739	11·720	11·700	20
1	12·139	12·128	12·116	12·104	12·089	12·073	12·056	12·038	12·017	11·995	1
2	12·430	12·418	12·405	12·391	12·374	12·358	12·338	12·318	12·295	12·271	2
3	12·704	12·691	12·677	12·661	12·643	12·625	12·604	12·582	12·557	12·530	3
4	12·963	12·948	12·932	12·915	12·896	12·875	12·853	12·828	12·801	12·772	4
25	13·206	13·190	13·172	13·154	13·133	13·111	13·086	13·060	13·030	12·999	25
6	13·434	13·417	13·398	13·378	13·355	13·331	13·305	13·276	13·244	13·210	6
7	13·649	13·631	13·610	13·589	13·564	13·538	13·509	13·478	13·444	13·408	7
8	13·851	13·831	13·809	13·786	13·759	13·732	13·701	13·667	13·631	13·591	8
9	14·041	14·020	13·996	13·971	13·942	13·913	13·879	13·844	13·804	13·762	9
30	14·219	14·196	14·171	14·144	14·113	14·081	14·046	14·008	13·966	13·921	30
1	14·386	14·362	14·335	14·306	14·273	14·239	14·201	14·160	14·115	14·068	1
2	14·543	14·516	14·488	14·457	14·422	14·386	14·345	14·302	14·254	14·203	2
3	14·689	14·661	14·630	14·598	14·561	14·522	14·479	14·433	14·383	14·329	3
4	14·826	14·796	14·764	14·729	14·690	14·649	14·603	14·555	14·501	14·444	4
35	14·954	14·922	14·888	14·851	14·810	14·766	14·718	14·667	14·610	14·550	35
6	15·073	15·039	15·003	14·964	14·920	14·874	14·824	14·770	14·710	14·647	6
7	15·184	15·149	15·110	15·069	15·023	14·975	14·921	14·864	14·802	14·735	7
8	15·287	15·250	15·209	15·166	15·118	15·067	15·011	14·951	14·886	14·816	8
9	15·383	15·344	15·301	15·255	15·205	15·151	15·093	15·030	14·962	14·889	9
40	15·472	15·431	15·386	15·338	15·285	15·229	15·167	15·102	15·030	14·955	40
1	15·554	15·511	15·464	15·413	15·358	15·299	15·235	15·167	15·093	15·014	1
2	15·630	15·584	15·535	15·483	15·425	15·364	15·295	15·226	15·148	15·066	2
3	15·699	15·652	15·601	15·546	15·486	15·422	15·352	15·278	15·198	15·113	3
4	15·763	15·714	15·660	15·603	15·541	15·474	15·402	15·326	15·243	15·155	4
45	15·822	15·770	15·715	15·655	15·590	15·521	15·447	15·367	15·282	15·191	45
6	15·875	15·822	15·764	15·702	15·635	15·564	15·486	15·404	15·316	15·223	6
7	15·924	15·868	15·808	15·744	15·675	15·601	15·521	15·437	15·346	15·250	7
8	15·968	15·910	15·848	15·782	15·710	15·634	15·552	15·465	15·372	15·274	8
9	16·008	15·948	15·884	15·815	15·741	15·663	15·579	15·490	15·394	15·294	9
	20	21	22	23	24	25	26	27	28	29	

0<sup>[m]</sup>

$a_{[x]m}$

5 per-cent.

Duration	30	31	32	33	34	35	36	37	38	39	Duration
	15-255	15-130	15-001	14-866	14-728	14-583	14-434	14-279	14-120	13-955	
0	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	0
1	.949	.949	.949	.949	.949	.949	.949	.949	.949	.948	1
2	1-849	1-849	1-849	1-848	1-848	1-848	1-847	1-847	1-846	1-846	2
3	2-701	2-700	2-700	2-699	2-699	2-698	2-697	2-696	2-695	2-694	3
4	3-507	3-506	3-505	3-504	3-503	3-502	3-500	3-499	3-497	3-495	4
5	4-269	4-268	4-267	4-265	4-263	4-261	4-259	4-257	4-254	4-252	5
6	4-990	4-989	4-987	4-984	4-982	4-979	4-976	4-972	4-969	4-965	6
7	5-672	5-669	5-666	5-663	5-660	5-656	5-651	5-647	5-642	5-636	7
8	6-315	6-312	6-308	6-303	6-299	6-294	6-288	6-282	6-276	6-269	8
9	6-923	6-918	6-913	6-908	6-902	6-896	6-888	6-881	6-872	6-863	9
10	7-496	7-490	7-484	7-477	7-470	7-462	7-453	7-443	7-433	7-421	10
1	8-036	8-029	8-022	8-013	8-005	7-995	7-984	7-972	7-959	7-945	1
2	8-546	8-537	8-528	8-518	8-508	8-496	8-483	8-469	8-454	8-437	2
3	9-026	9-016	9-005	8-993	8-981	8-967	8-951	8-935	8-917	8-897	3
4	9-478	9-466	9-454	9-440	9-425	9-409	9-391	9-372	9-351	9-328	4
15	9-903	9-890	9-876	9-860	9-843	9-824	9-803	9-781	9-757	9-731	15
6	10-304	10-288	10-272	10-254	10-235	10-213	10-190	10-164	10-137	10-107	6
7	10-680	10-663	10-645	10-624	10-602	10-578	10-551	10-523	10-491	10-458	7
8	11-034	11-015	10-994	10-971	10-946	10-919	10-889	10-857	10-822	10-784	8
9	11-366	11-345	11-322	11-296	11-268	11-238	11-205	11-169	11-130	11-088	9
20	11-678	11-654	11-629	11-600	11-569	11-536	11-499	11-459	11-416	11-370	20
1	11-971	11-944	11-916	11-884	11-851	11-814	11-773	11-730	11-682	11-631	1
2	12-245	12-216	12-184	12-150	12-113	12-072	12-028	11-980	11-929	11-873	2
3	12-501	12-469	12-435	12-397	12-357	12-313	12-264	12-213	12-156	12-095	3
4	12-741	12-706	12-669	12-628	12-584	12-536	12-484	12-427	12-366	12-301	4
25	12-964	12-927	12-887	12-842	12-795	12-743	12-686	12-626	12-560	12-489	25
6	13-173	13-133	13-089	13-041	12-990	12-934	12-873	12-808	12-737	12-661	6
7	13-368	13-324	13-277	13-226	13-171	13-111	13-045	12-976	12-900	12-819	7
8	13-548	13-502	13-452	13-396	13-337	13-273	13-203	13-129	13-048	12-962	8
9	13-716	13-666	13-613	13-553	13-491	13-422	13-348	13-269	13-183	13-091	9
30	13-872	13-818	13-761	13-698	13-632	13-559	13-480	13-396	13-305	13-208	30
1	14-015	13-959	13-898	13-831	13-761	13-683	13-600	13-511	13-416	13-313	1
2	14-148	14-088	14-024	13-953	13-878	13-797	13-709	13-615	13-514	13-407	2
3	14-270	14-207	14-138	14-064	13-985	13-899	13-807	13-708	13-603	13-490	3
4	14-382	14-315	14-243	14-165	14-082	13-992	13-895	13-792	13-682	13-564	4
35	14-485	14-414	14-339	14-256	14-169	14-075	13-974	13-866	13-751	13-628	35
6	14-578	14-504	14-425	14-339	14-248	14-149	14-044	13-932	13-812	13-685	6
7	14-663	14-586	14-503	14-413	14-318	14-215	14-106	13-989	13-865	13-734	7
8	14-741	14-659	14-573	14-479	14-380	14-274	14-160	14-039	13-911	13-775	8
9	14-810	14-726	14-636	14-538	14-435	14-325	14-207	14-083	13-950	13-811	9
40	14-873	14-785	14-691	14-590	14-484	14-370	14-248	14-120	13-984	13-841	40
1	14-928	14-837	14-740	14-636	14-526	14-408	14-283	14-151	14-012	13-866	1
2	14-978	14-884	14-783	14-676	14-562	14-441	14-313	14-178	14-036	13-886	2
3	15-022	14-925	14-821	14-710	14-594	14-469	14-338	14-200	14-055	13-903	3
4	15-060	14-960	14-853	14-739	14-620	14-493	14-359	14-218	14-070	13-916	4
45	15-094	14-990	14-881	14-765	14-642	14-513	14-376	14-233	14-083	13-926	45
6	15-123	15-017	14-905	14-786	14-661	14-529	14-390	14-245	14-093	13-934	6
7	15-148	15-039	14-925	14-803	14-676	14-542	14-401	14-254	14-100	13-940	7
8	15-169	15-058	14-942	14-818	14-689	14-552	14-410	14-261	14-106	13-945	8
9	15-187	15-074	14-955	14-829	14-699	14-561	14-417	14-266	14-110	13-948	9
	30	31	32	33	34	35	36	37	38	39	

0<sup>(M)</sup>

$\alpha_{[20]n}$

5 per-cent.

Duration	40	41	42	43	44	45	46	47	48	49	Duration
	13-784	13-610	13-429	13-242	13-051	12-854	12-652	12-445	12-233	12-017	
0	·000	·000	·000	·000	·000	·000	·000	·000	·000	·000	0
1	·948	·948	·948	·948	·947	·947	·947	·946	·946	·946	1
2	1·845	1·845	1·844	1·843	1·843	1·842	1·841	1·840	1·839	1·837	2
3	2·693	2·692	2·691	2·689	2·687	2·686	2·684	2·682	2·679	2·677	3
4	3·493	3·491	3·489	3·486	3·484	3·481	3·477	3·474	3·470	3·465	4
5	4·248	4·245	4·242	4·238	4·233	4·229	4·224	4·218	4·212	4·205	5
6	4·960	4·956	4·950	4·945	4·938	4·932	4·924	4·916	4·907	4·898	6
7	5·630	5·624	5·617	5·609	5·600	5·591	5·581	5·570	5·558	5·545	7
8	6·261	6·252	6·243	6·233	6·221	6·209	6·196	6·182	6·166	6·149	8
9	6·853	6·842	6·830	6·817	6·803	6·788	6·771	6·752	6·732	6·711	9
10	7·409	7·396	7·381	7·365	7·347	7·328	7·307	7·284	7·259	7·232	10
1	7·930	7·914	7·896	7·876	7·855	7·831	7·806	7·778	7·748	7·716	1
2	8·418	8·399	8·378	8·354	8·328	8·300	8·270	8·237	8·202	8·163	2
3	8·875	8·853	8·827	8·799	8·769	8·737	8·701	8·662	8·621	8·575	3
4	9·303	9·276	9·247	9·214	9·179	9·142	9·100	9·056	9·007	8·955	4
15	9·702	9·671	9·637	9·600	9·560	9·517	9·470	9·418	9·363	9·303	15
6	10·074	10·039	10·001	9·958	9·913	9·864	9·810	9·752	9·690	9·622	6
7	10·420	10·381	10·338	10·290	10·239	10·184	10·124	10·059	9·989	9·914	7
8	10·743	10·699	10·650	10·597	10·540	10·478	10·412	10·339	10·262	10·178	8
9	11·042	10·993	10·939	10·880	10·817	10·749	10·675	10·596	10·510	10·418	9
20	11·319	11·265	11·205	11·141	11·071	10·996	10·915	10·828	10·735	10·634	20
1	11·575	11·516	11·451	11·380	11·304	11·222	11·134	11·039	10·938	10·829	1
2	11·812	11·747	11·676	11·599	11·516	11·428	11·332	11·229	11·120	11·002	2
3	12·029	11·959	11·882	11·799	11·709	11·614	11·511	11·400	11·282	11·156	3
4	12·229	12·153	12·070	11·980	11·884	11·781	11·671	11·553	11·427	11·293	4
25	12·412	12·330	12·241	12·145	12·042	11·932	11·814	11·689	11·555	11·412	25
6	12·579	12·491	12·396	12·293	12·184	12·067	11·942	11·809	11·667	11·517	6
7	12·730	12·637	12·536	12·427	12·311	12·187	12·055	11·914	11·765	11·607	7
8	12·868	12·769	12·661	12·546	12·423	12·292	12·153	12·006	11·849	11·684	8
9	12·992	12·887	12·773	12·652	12·523	12·385	12·239	12·085	11·922	11·750	9
30	13·103	12·992	12·873	12·745	12·610	12·466	12·314	12·153	11·984	11·805	30
1	13·203	13·086	12·961	12·828	12·686	12·536	12·378	12·211	12·035	11·851	1
2	13·291	13·169	13·039	12·899	12·752	12·596	12·432	12·259	12·079	11·889	2
3	13·369	13·242	13·106	12·961	12·808	12·647	12·478	12·300	12·114	11·920	3
4	13·438	13·305	13·164	13·014	12·856	12·690	12·516	12·333	12·143	11·944	4
35	13·498	13·360	13·214	13·059	12·897	12·726	12·547	12·360	12·166	11·963	35
6	13·549	13·407	13·257	13·097	12·930	12·755	12·572	12·382	12·184	11·978	6
7	13·594	13·447	13·292	13·129	12·958	12·779	12·593	12·399	12·198	11·990	7
8	13·631	13·481	13·322	13·155	12·980	12·798	12·608	12·412	12·208	11·998	8
9	13·663	13·509	13·347	13·176	12·998	12·812	12·621	12·422	12·216	12·004	9
40	13·690	13·532	13·366	13·193	13·012	12·824	12·630	12·429	12·222	12·008	40
1	13·711	13·551	13·382	13·206	13·023	12·833	12·637	12·434	12·226	12·011	1
2	13·729	13·566	13·395	13·216	13·031	12·840	12·642	12·438	12·229	12·013	2
3	13·743	13·577	13·404	13·224	13·037	12·844	12·646	12·441	12·230	12·015	3
4	13·754	13·586	13·412	13·230	13·042	12·848	12·648	12·442	12·232	12·015	4
45	13·762	13·593	13·417	13·234	13·045	12·850	12·650	12·444	12·232	12·016	45
6	13·769	13·598	13·421	13·237	13·047	12·852	12·651	12·444	12·233	12·016	6
7	13·774	13·602	13·424	13·239	13·048	12·853	12·651	12·445	12·233	12·016	7
8	13·777	13·605	13·426	13·240	13·049	12·853	12·652	12·445	12·233	12·016	8
9	13·780	13·606	13·427	13·241	13·050	12·854	12·652	12·445	12·233	12·016	9
	40	41	42	43	44	45	46	47	48	49	

0<sup>[M]</sup>

$a_{[x]n}$

5 per-cent.

Duration	50	51	52	53	54	55	56	57	58	59	Duration
	11·795	11·569	11·388	11·104	10·865	10·623	10·377	10·128	9·876	9·622	
0	·000	·000	·000	·000	·000	·000	·000	·000	·000	·000	0
1	·945	·945	·944	·944	·943	·942	·942	·941	·940	·939	1
2	1·836	1·835	1·833	1·831	1·829	1·827	1·825	1·823	1·820	1·817	2
3	2·674	2·671	2·668	2·664	2·660	2·656	2·651	2·646	2·640	2·634	3
4	3·461	3·455	3·450	3·444	3·437	3·429	3·421	3·413	3·403	3·393	4
5	4·198	4·190	4·181	4·171	4·161	4·150	4·138	4·124	4·109	4·094	5
6	4·887	4·876	4·863	4·850	4·835	4·819	4·801	4·782	4·761	4·739	6
7	5·531	5·515	5·498	5·480	5·460	5·438	5·414	5·388	5·360	5·330	7
8	6·130	6·110	6·088	6·063	6·037	6·009	5·978	5·944	5·908	5·869	8
9	6·687	6·661	6·633	6·603	6·570	6·534	6·495	6·453	6·407	6·358	9
10	7·203	7·171	7·137	7·099	7·059	7·014	6·967	6·915	6·860	6·800	10
1	7·680	7·642	7·600	7·555	7·506	7·453	7·396	7·334	7·268	7·196	1
2	8·121	8·075	8·026	7·972	7·915	7·852	7·785	7·712	7·635	7·551	2
3	8·526	8·473	8·415	8·353	8·286	8·213	8·136	8·052	7·962	7·866	3
4	8·898	8·837	8·771	8·699	8·622	8·539	8·451	8·355	8·253	8·144	4
15	9·239	9·169	9·094	9·013	8·926	8·832	8·732	8·625	8·510	8·388	15
6	9·550	9·471	9·387	9·296	9·198	9·094	8·982	8·863	8·736	8·601	6
7	9·832	9·745	9·651	9·550	9·442	9·326	9·203	9·072	8·933	8·786	7
8	10·088	9·992	9·888	9·777	9·658	9·532	9·398	9·254	9·103	8·944	8
9	10·319	10·213	10·100	9·979	9·850	9·712	9·567	9·412	9·249	9·078	9
20	10·527	10·411	10·288	10·157	10·018	9·869	9·713	9·547	9·373	9·191	20
1	10·712	10·587	10·455	10·314	10·164	10·005	9·838	9·662	9·478	9·285	1
2	10·877	10·743	10·601	10·450	10·290	10·122	9·945	9·759	9·564	9·362	2
3	11·022	10·880	10·728	10·568	10·399	10·221	10·035	9·839	9·636	9·424	3
4	11·150	10·999	10·838	10·669	10·491	10·304	10·109	9·905	9·694	9·474	4
25	11·261	11·101	10·933	10·755	10·569	10·374	10·170	9·959	9·740	9·514	25
6	11·358	11·190	11·013	10·827	10·633	10·431	10·220	10·002	9·776	9·544	6
7	11·440	11·265	11·081	10·888	10·686	10·477	10·260	10·035	9·804	9·567	7
8	11·511	11·328	11·137	10·937	10·729	10·514	10·291	10·061	9·826	9·584	8
9	11·570	11·380	11·183	10·977	10·764	10·543	10·315	10·081	9·841	9·597	9
30	11·619	11·423	11·220	11·009	10·791	10·565	10·333	10·096	9·853	9·605	30
1	11·659	11·458	11·250	11·034	10·812	10·582	10·347	10·106	9·861	9·611	1
2	11·692	11·486	11·274	11·054	10·827	10·595	10·356	10·114	9·867	9·616	2
3	11·718	11·508	11·292	11·069	10·839	10·604	10·363	10·119	9·870	9·618	3
4	11·738	11·525	11·306	11·080	10·848	10·610	10·368	10·122	9·873	9·620	4
35	11·754	11·538	11·316	11·087	10·854	10·615	10·371	10·125	9·874	9·621	35
6	11·766	11·548	11·323	11·093	10·858	10·618	10·374	10·126	9·875	9·621	6
7	11·775	11·555	11·329	11·097	10·861	10·620	10·375	10·127	9·876	9·622	7
8	11·782	11·560	11·332	11·100	10·862	10·621	10·376	10·127	9·876	9·622	8
9	11·786	11·563	11·335	11·101	10·864	10·622	10·376	10·128	9·876	9·622	9
40	11·790	11·565	11·336	11·102	10·864	10·622	10·376	10·128	9·876	9·622	40
1	11·792	11·567	11·337	11·103	10·865	10·622	10·376	10·128	9·876	9·622	1
2	11·793	11·568	11·338	11·103	10·865	10·623	10·377	10·128	9·876	9·622	2
3	11·794	11·568	11·338	11·104	10·865	10·623	10·377	10·128	9·876	9·622	3
4	11·794	11·569	11·338	11·104	10·865	10·623	10·377	10·128	9·876	9·622	4
45	11·795	11·569	11·338	11·104	10·865	10·623	10·377	10·128	9·876	9·622	45
6	11·795	11·569	11·338	11·104	10·865	10·623	10·377	10·128	9·876	9·622	6
7	11·795	11·569	11·338	11·104	10·865	10·623	10·377	10·128	9·876	...	7
8	11·795	11·569	11·338	11·104	10·865	10·623	10·377	10·128	...	...	8
9	11·795	11·569	11·338	11·104	10·865	10·623	10·377	...	...	...	9
	50	51	52	53	54	55	56	57	58	59	

$\alpha_{[m]}$

$\alpha_{[x]n}$

5 per-cent.

Duration	60	61	62	63	64	65	66	67	68	69	Duration
	9.366	9.107	8.847	8.587	8.325	8.063	7.802	7.541	7.281	7.022	
0	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	0
1	.938	.937	.936	.934	.933	.931	.930	.928	.926	.923	1
2	1.814	1.810	1.806	1.802	1.798	1.793	1.787	1.781	1.775	1.768	2
3	2.628	2.621	2.613	2.604	2.595	2.585	2.573	2.561	2.548	2.534	3
4	3.381	3.369	3.356	3.341	3.325	3.308	3.289	3.269	3.247	3.223	4
5	4.076	4.058	4.037	4.015	3.991	3.965	3.936	3.906	3.873	3.837	5
6	4.714	4.688	4.658	4.627	4.593	4.557	4.517	4.474	4.428	4.378	6
7	5.297	5.261	5.222	5.180	5.135	5.086	5.034	4.977	4.917	4.851	7
8	5.826	5.780	5.730	5.677	5.619	5.557	5.490	5.418	5.342	5.259	8
9	6.305	6.248	6.186	6.119	6.048	5.971	5.889	5.801	5.708	5.608	9
10	6.735	6.666	6.590	6.510	6.424	6.332	6.234	6.130	6.019	5.901	10
1	7.119	7.037	6.948	6.853	6.752	6.645	6.530	6.409	6.281	6.145	1
2	7.461	7.365	7.262	7.153	7.036	6.913	6.782	6.644	6.498	6.345	2
3	7.763	7.653	7.536	7.411	7.280	7.140	6.993	6.839	6.677	6.508	3
4	8.028	7.904	7.773	7.633	7.487	7.332	7.169	7.000	6.822	6.638	4
15	8.259	8.121	7.976	7.822	7.661	7.491	7.314	7.130	6.938	6.740	15
6	8.459	8.308	8.148	7.981	7.805	7.622	7.431	7.234	7.030	6.819	6
7	8.630	8.466	8.293	8.113	7.924	7.728	7.525	7.315	7.100	6.879	7
8	8.776	8.599	8.414	8.221	8.021	7.813	7.599	7.379	7.154	6.923	8
9	8.898	8.710	8.513	8.309	8.098	7.880	7.656	7.427	7.193	6.956	9
20	9.000	8.801	8.593	8.379	8.158	7.931	7.699	7.462	7.222	6.979	20
1	9.083	8.874	8.658	8.434	8.205	7.970	7.731	7.488	7.243	6.994	1
2	9.151	8.933	8.708	8.477	8.241	7.999	7.754	7.506	7.257	7.005	2
3	9.205	8.980	8.747	8.509	8.267	8.020	7.771	7.519	7.266	7.012	3
4	9.248	9.016	8.777	8.534	8.286	8.035	7.782	7.527	7.272	7.016	4
25	9.281	9.042	8.799	8.551	8.300	8.046	7.790	7.533	7.276	7.018	25
6	9.306	9.063	8.815	8.563	8.309	8.053	7.795	7.536	7.278	7.020	6
7	9.325	9.077	8.826	8.572	8.315	8.057	7.798	7.538	7.279	7.021	7
8	9.338	9.088	8.834	8.578	8.319	8.060	7.800	7.540	7.280	7.021	8
9	9.348	9.095	8.839	8.581	8.322	8.061	7.801	7.540	7.281	7.021	9
30	9.354	9.099	8.843	8.584	8.324	8.062	7.801	7.541	7.281	7.022	30
1	9.359	9.103	8.845	8.585	8.324	8.063	7.802	7.541	7.281	7.022	1
2	9.362	9.105	8.846	8.586	8.325	8.063	7.802	7.541	7.281	7.022	2
3	9.363	9.106	8.847	8.586	8.325	8.063	7.802	7.541	7.281	7.022	3
4	9.364	9.106	8.847	8.586	8.325	8.063	7.802	7.541	7.281	7.022	4
35	9.365	9.107	8.847	8.587	8.325	8.063	7.802	7.541	7.281	7.022	35
6	9.365	9.107	8.847	8.587	8.325	8.063	7.802	7.541	7.281	7.022	6
7	9.365	9.107	8.847	8.587	8.325	8.063	7.802	7.541	7.281		
8	9.366	9.107	8.847	8.587	8.325	8.063	7.802	7.541		47	
9	9.366	9.107	8.847	8.587	8.325	8.063	7.802		48		
40	9.366	9.107	8.847	8.587	8.325	8.063		49	12.233	12.445	
1	9.366	9.107	8.847	8.587	8.325						58
2	9.366	9.107	8.847	8.587		51	12.017		12.233	12.445	7
3	9.366	9.107	8.847		52		11.795	12.017	12.233	12.445	6
4	9.366	9.107		53				11.795	12.017	12.233	5
45	9.366		54		11.338						54
	...	55		11.104	11.338	11.569	11.795	12.017	12.233	12.445	3
	...	10.623		11.104	11.338	11.569	11.795	12.017	12.233	12.445	2
	...		10.865	11.104	11.338	11.569	11.795	12.017	12.233	12.445	1
	...	10.623	10.865	11.104	11.338	11.569	11.795	12.016	12.233	12.445	0
	60	55	54	53	52	51	50	49	48	47	

0<sup>[M]</sup>

$\alpha_{[z]m}$

5 per-cent.

Duration	70	71	72	73	74	75					Duration
	6.765	6.510	6.257	6.008	5.762	5.519					
0	.000	.000	.000	.000	.000	.000					0
1	.921	.918	.915	.912	.908	.904					1
2	1.760	1.752	1.743	1.733	1.722	1.711					2
3	2.519	2.502	2.483	2.464	2.442	2.419					3
4	3.197	3.169	3.139	3.106	3.071	3.033					4
5	3.798	3.756	3.712	3.663	3.612	3.556					5
6	4.325	4.267	4.206	4.140	4.070	3.995					6
7	4.781	4.707	4.627	4.542	4.452	4.356					7
8	5.172	5.079	4.980	4.875	4.765	4.649					8
9	5.502	5.390	5.272	5.147	5.017	4.880					9
10	5.777	5.646	5.509	5.365	5.215	5.059					10
1	6.003	5.854	5.698	5.536	5.368	5.195					1
2	6.186	6.020	5.847	5.669	5.485	5.296					2
3	6.333	6.150	5.962	5.769	5.571	5.369					3
4	6.448	6.251	6.049	5.843	5.634	5.421					4
15	6.537	6.328	6.114	5.898	5.678	5.457					15
6	6.604	6.384	6.161	5.936	5.709	5.481					6
7	6.654	6.426	6.195	5.962	5.729	5.496					7
8	6.691	6.455	6.218	5.980	5.742	5.506					8
9	6.716	6.475	6.233	5.991	5.751	5.512					9
20	6.734	6.489	6.243	5.998	5.756	5.515					20
1	6.746	6.497	6.249	6.003	5.758	5.517					1
2	6.754	6.503	6.253	6.005	5.760	5.518					2
3	6.759	6.506	6.255	6.007	5.761	5.518					3
4	6.761	6.508	6.256	6.007	5.761	5.519					4
25	6.763	6.509	6.257	6.008	5.761	5.519					25
6	6.764	6.509	6.257	6.008	5.762	5.519					6
7	6.764	6.510	6.257	6.008	5.762	5.519					7
8	6.765	6.510	6.257	6.008	5.762	5.519					8
9	6.765	6.510	6.257	6.008	5.762	5.519			38		9
30	6.765	6.510	6.257	6.008	5.762	5.519					30
1	6.765	6.510	6.257	6.008	5.762		40	39	14.120	14.279	68
2	6.765	6.510	6.257	6.008				13.955		14.120	7
3	6.765	6.510	6.257		42		13.784	13.955	14.120	14.279	6
4	6.765	6.510		43		13.610	13.784	13.955	14.120	14.279	5
35	6.765		44		13.429	13.610	13.784	13.955	14.120	14.279	64
		45		13.242	13.429	13.610	13.784	13.955	14.120	14.279	3
	46	12.854		13.242	13.429	13.610	13.784	13.955	14.120	14.279	2
	12.652	13.051		13.242	13.429	13.610	13.784	13.955	14.120	14.279	1
		13.051		13.242	13.429	13.610	13.784	13.955	14.120	14.279	0
59	12.652	12.854	13.051	13.242	13.429	13.610	13.784	13.955	14.120	14.279	59
8	12.652	12.854	13.051	13.242	13.429	13.610	13.784	13.955	14.120	14.279	8
7	12.652	12.854	13.051	13.242	13.429	13.610	13.784	13.955	14.120	14.279	7
6	12.652	12.854	13.051	13.242	13.429	13.610	13.784	13.955	14.119	14.279	6
5	12.652	12.854	13.051	13.242	13.429	13.610	13.784	13.955	14.119	14.278	5
54	12.652	12.854	13.051	13.242	13.429	13.609	13.784	13.954	14.119	14.278	54
3	12.652	12.854	13.051	13.242	13.429	13.609	13.784	13.954	14.118	14.277	3
2	12.652	12.854	13.051	13.242	13.429	13.609	13.783	13.953	14.117	14.275	2
1	12.652	12.854	13.051	13.242	13.428	13.608	13.782	13.952	14.116	14.273	1
0	12.652	12.854	13.050	13.242	13.428	13.608	13.781	13.951	14.113	14.270	0
	46	45	44	43	42	41	40	39	38	37	







0<sup>[M]</sup>  $\alpha_{[x]u}$  5 per-cent.

Duration								Duration	
	16		15	14	13	12	11	10	
	16	16	15	14	13	12	11	10	
	16	16	15	14	13	12	11	10	
							16 863	16 916	95
						16 808	16 863	16 916	94
						16 808	16 863	16 916	93
						16 808	16 863	16 916	92
						16 808	16 863	16 916	91
						16 808	16 863	16 916	90
89	16 559	16 626	16 689	16 750	16 808	16 863	16 916	89	89
8	16 559	16 626	16 689	16 750	16 808	16 863	16 916	88	88
7	16 559	16 626	16 689	16 750	16 808	16 863	16 916	87	87
6	16 559	16 626	16 689	16 750	16 808	16 863	16 916	86	86
5	16 559	16 626	16 689	16 750	16 808	16 863	16 916	85	85
84	16 559	16 626	16 689	16 750	16 808	16 863	16 916	84	84
3	16 559	16 626	16 689	16 750	16 808	16 863	16 916	83	83
2	16 559	16 626	16 689	16 750	16 808	16 863	16 916	82	82
1	16 559	16 626	16 689	16 750	16 808	16 863	16 916	81	81
0	16 559	16 626	16 689	16 750	16 808	16 863	16 915	80	80
79	16 559	16 626	16 689	16 750	16 807	16 863	16 915	79	79
8	16 559	16 626	16 689	16 749	16 807	16 862	16 915	8	8
7	16 559	16 626	16 689	16 749	16 807	16 862	16 914	7	7
6	16 559	16 625	16 689	16 749	16 806	16 861	16 913	6	6
5	16 559	16 625	16 688	16 748	16 806	16 860	16 912	5	5
74	16 558	16 625	16 688	16 747	16 805	16 859	16 910	74	74
3	16 558	16 624	16 687	16 746	16 803	16 857	16 908	3	3
2	16 557	16 623	16 686	16 745	16 802	16 855	16 906	2	2
1	16 556	16 622	16 684	16 743	16 799	16 852	16 902	1	1
0	16 555	16 620	16 682	16 741	16 796	16 849	16 898	0	0
69	16 553	16 618	16 680	16 738	16 793	16 845	16 894	69	69
8	16 551	16 616	16 677	16 734	16 788	16 840	16 888	8	8
7	16 548	16 612	16 673	16 729	16 783	16 833	16 881	7	7
6	16 545	16 608	16 668	16 723	16 776	16 826	16 873	6	6
5	16 540	16 603	16 662	16 717	16 769	16 817	16 863	5	5
64	16 535	16 596	16 654	16 708	16 760	16 807	16 852	64	64
3	16 528	16 589	16 646	16 699	16 749	16 796	16 839	3	3
2	16 520	16 580	16 635	16 687	16 737	16 782	16 825	2	2
1	16 510	16 569	16 624	16 674	16 722	16 767	16 809	1	1
0	16 499	16 556	16 610	16 660	16 706	16 750	16 790	0	0
59	16 486	16 542	16 594	16 643	16 688	16 731	16 770	59	59
8	16 470	16 525	16 576	16 623	16 668	16 709	16 747	8	8
7	16 453	16 506	16 556	16 602	16 645	16 685	16 722	7	7
6	16 433	16 485	16 533	16 578	16 619	16 658	16 694	6	6
5	16 410	16 460	16 507	16 551	16 591	16 628	16 663	5	5
54	16 384	16 433	16 479	16 521	16 560	16 596	16 629	54	54
3	16 356	16 403	16 447	16 488	16 525	16 560	16 593	3	3
2	16 324	16 370	16 412	16 451	16 488	16 521	16 552	2	2
1	16 289	16 333	16 374	16 412	16 447	16 479	16 509	1	1
0	16 250	16 293	16 332	16 368	16 402	16 433	16 462	0	0
	16	15	14	13	12	11	10		