TABLE OF FRESNEL INTEGRALS

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BY

A. VAN WIJNGAARDEN and W. L. SCHEEN

(REPORT R 49 OF THE COMPUTATION DEPARTMENT
OF THE MATHEMATICAL CENTRE AT AMSTERDAM)

VERHANDELINGEN DER KONINKLIJKE NEDERLANDSCHE
AKADEMIE VAN WETENSCHAPPEN, AFD. NATUURKUNDE

EERSTE SECTIE, DEEL XIX, Nº. 4

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1. *Definition.* We prepared a table of the Fresnel integrals, defined by

$$C(u)=\int_0^u \cos\frac{\pi}{2}t^2\,dt, \quad \ldots\ldots\ldots, \quad (1a)$$

$$S(u)=\int_0^u \sin\frac{\pi}{2}t^2\,dt, \quad \ldots\ldots\ldots. \quad (1b)$$

They have the following expansions in ascending powers of u, converging uniformly for all finite u:

$$C(u)=\sum_{k=0}^{\infty} C_{4k+1}\,u^{4k+1}, \quad C_{4k+1}=(-1)^k\frac{(\pi/2)^{2k}}{(2k)!\,(4k+1)}, \quad . \quad (2a)$$

$$S(u)=\sum_{k=0}^{\infty} S_{4k+3}\,u^{4k+3}, \quad S_{4k+3}=(-1)^k\frac{(\pi/2)^{2k+1}}{(2k+1)!\,(4k+3)}. \quad (2b)$$

The numerical values of a number of the coefficients C_{4k+1} and S_{4k+3} are:

$C_1 = 1$
$C_5 = -2.467401100272340\times10^{-1}$
$C_9 = 2.818550087789422\times10^{-2}$
$C_{13} = -1.604883135642535\times10^{-3}$
$C_{17} = 5.407413381408392\times10^{-5}$
$C_{21} = -1.200097255860029\times10^{-6}$
$C_{25} = 1.884349911527269\times10^{-8}$
$C_{29} = -2.202276925445466\times10^{-10}$
$C_{33} = 1.98968579241802\times10^{-12}$
$C_{37} = -1.4309189731715\times10^{-14}$
$C_{41} = 8.384729705119\times10^{-17}$
$C_{45} = -4.07998144923\times10^{-19}$
$C_{49} = 1.6748476126\times10^{-21}$
$C_{53} = -5.877896118\times10^{-24}$
$C_{57} = 1.78377831\times10^{-26}$
$C_{61} = -4.7272264\times10^{-29}$
$C_{65} = 1.103446\times10^{-31}$
$C_{69} = -2.28593\times10^{-34}$
$C_{73} = 4.2311\times10^{-37}$
$C_{77} = -7.040\times10^{-40}$
$C_{81} = 1.06\times10^{-42}$
$C_{85} = -1.4\times10^{-45}$
$C_{89} = 2\times10^{-49}$

$S_3 = 5.235987755982989\times10^{-1}$
$S_7 = -9.228058535803518\times10^{-2}$
$S_{11} = 7.244784204197004\times10^{-3}$
$S_{15} = -3.121169423545792\times10^{-4}$
$S_{19} = 8.444272883545254\times10^{-6}$
$S_{23} = -1.564714450092211\times10^{-7}$
$S_{27} = 2.108212193321454\times10^{-9}$
$S_{31} = -2.15743068058434\times10^{-11}$
$S_{35} = 1.7334102088875\times10^{-13}$
$S_{39} = -1.122324478798\times10^{-15}$
$S_{43} = 5.98005323921\times10^{-18}$
$S_{47} = -2.6678713628\times10^{-20}$
$S_{51} = 1.011069642\times10^{-22}$
$S_{55} = -3.29527148\times10^{-25}$
$S_{59} = 9.3343827\times10^{-28}$
$S_{63} = -2.319284\times10^{-30}$
$S_{67} = 5.09556\times10^{-33}$
$S_{71} = -9.9702\times10^{-36}$
$S_{75} = 1.748\times10^{-38}$
$S_{79} = -2.76\times10^{-41}$
$S_{83} = 4.0\times10^{-44}$
$S_{87} = -5\times10^{-47}$

Asymptotic expansions are:

$$C(u)\sim\frac{1}{2}+\sin\frac{\pi}{2}u^2\sum_{k=0}^{\infty}\gamma_{4k+1}\,u^{-(4k+1)}-\cos\frac{\pi}{2}u^2\sum_{k=0}^{\infty}\sigma_{4k+3}\,u^{-(4k+3)}, \quad (3a)$$

$$S(u)\sim\frac{1}{2}-\cos\frac{\pi}{2}u^2\sum_{k=0}^{\infty}\gamma_{4k+1}\,u^{-(4k+1)}-\sin\frac{\pi}{2}u^2\sum_{k=0}^{\infty}\sigma_{4k+3}\,u^{-(4k+3)}, \quad (3b)$$

$$\gamma_{4k+1}=(-1)^k\,2\,\frac{(4k)!}{(2k)!}\,(2\pi)^{-(2k+1)}, \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots. \quad (3c)$$

$$\sigma_{4k+3}=(-1)^k\,2\,\frac{(4k+2)!}{(2k+1)!}\,(2\pi)^{-(2k+2)}. \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots. \quad (3d)$$

The numerical values of a number of the coefficients γ_{4k+1} and σ_{4k+3} are:

$$\gamma_1 = 3.1830988618\times 10^{-1}$$
$$\gamma_5 = -0.9675460330\times 10^{-1}$$
$$\gamma_9 = 3.4311518252\times 10^{-1}$$
$$\gamma_{13} = -3.4417188054$$
$$\gamma_{17} = 6.8000209511\times 10$$
$$\gamma_{21} = -2.2254253341\times 10^{3}$$
$$\gamma_{25} = 1.0890815809\times 10^{5}$$
$$\gamma_{29} = -7.4484248529\times 10^{6}$$
$$\gamma_{33} = 6.7846021691\times 10^{8}$$
$$\gamma_{37} = -7.9397463002\times 10^{10}$$
$$\gamma_{41} = 1.1608422633\times 10^{13}$$
$$\gamma_{45} = -2.0736037911\times 10^{15}$$
$$\gamma_{49} = 4.4436147994\times 10^{17}$$
$$\gamma_{53} = -1.1251305455\times 10^{20}$$
$$\gamma_{57} = 3.3230871339\times 10^{22}$$

$$\sigma_3 = 1.0132118364\times 10^{-1}$$
$$\sigma_7 = -1.5398973382\times 10^{-1}$$
$$\sigma_{11} = 9.8295259226\times 10^{-1}$$
$$\sigma_{15} = -1.4241930576\times 10$$
$$\sigma_{19} = 3.6796736215\times 10^{2}$$
$$\sigma_{23} = -1.4875872581\times 10^{4}$$
$$\sigma_{27} = 8.6666358514\times 10^{5}$$
$$\sigma_{31} = -6.8756310748\times 10^{7}$$
$$\sigma_{35} = 7.1266996137\times 10^{9}$$
$$\sigma_{39} = -9.3510090422\times 10^{11}$$
$$\sigma_{43} = 1.5149810317\times 10^{14}$$
$$\sigma_{47} = -2.9702186403\times 10^{16}$$
$$\sigma_{51} = 6.9307879532\times 10^{18}$$
$$\sigma_{55} = -1.8981429322\times 10^{21}$$

2. *Preparation of the table.* For $u = 0(.5)\ 2.5$ we first computed 9-decimal values of $C(u)$ and $S(u)$ from the ascending series (2*a*, *b*). For $u = 2.5(.5)12$ we did the same from the asymptotic series (3*a*, *b*, *c*, *d*). In order to get this accuracy by means of the asymptotic series for values of u as low as 2.5 we used the technique of 'Eulering', described by GOODWIN and STATON [1]). It can be proved that this technique yields here actually the exact values. The technique is checked, moreover, by the equivalence of the values found for $u = 2.5$ by means of both methods.

Next we prepared a preliminary 7-decimal table of $C(u)$ resp. $S(u)$ for $u = 0(.01)12$ by numerical integration of 5-decimal values of $\cos \frac{\pi}{2} t^2$ resp. $\sin \frac{\pi}{2} t^2$ with an interval $h = .01$. These values were differenced and summed at the same time on a National-machine, and the integration was performed by taking fifth central differences into account. After each 50 values we could check against the accurate values computed before. The discrepancy never exeeded a few units of the 7th decimal. Actually the sumfunction was corrected to the value it should have had before starting with the next fifty values. The 7-decimal table thus obtained was differenced again to check against accidental errors of one or more units of the 7th decimal.

Before rounding off these values to 5 decimals the systematic errors had to be considered. These are due to neglection of the remainderterm in the integration formula and to rounding-off errors.

The remainder term influence is small. An upper bound is constructed as follows. The remainder term in the formula for integration over the interval from x_0 up to $x_0 + h$ is $h^9 \frac{2497}{3628800} f^{(8)}(\xi)$, where $x_0 - 3h < \xi < x_0 + 4h$. If, therefore, $|f^{(8)}(x)| < N$ for all x that satisfy $x_0 - 3h < x < x_0 + 53h$

[1]) E. T. GOODWIN and J. STATON, Table of ...., Quart. J. Mech. a. App. Math., I, p. 319—326, 1948.

then the absolute value of the remainder in the integral from x_0 up to $x_0 + 50\,h$ is less than $\frac{2497}{72576} h^9 N$. Now is

$$\frac{d^8}{dx^8} \begin{matrix}\cos \\ \sin\end{matrix} \frac{\pi}{2} x^2 = \begin{matrix}\cos \\ \sin\end{matrix} \frac{\pi}{2} x^2 (\pi^8 x^8 - 210\,\pi^6 x^4 + 105\,\pi^4)$$
$$\pm \begin{matrix}\sin \\ \cos\end{matrix} \frac{\pi}{2} x^2 (28\,\pi^7 x^6 - 420\,\pi^5 x^2)$$
$$< \pi^8 x^8 + 28\,\pi^7 x^6 + 210\,\pi^6 x^4 + 420\,\pi^5 x^2 + 105\,\pi^4.$$

As this last expression is a monotonously ascending function of x, N may be taken as follows:

$$N = \pi^8 (x_0 + 53\,h)^8 + 28\,\pi^7 (x_0 + 53\,h)^6 + 210\,\pi^6 (x_0 + 53\,h)^4 + 420\,\pi^5 (x_0 + 53\,h)^2 + 105\,\pi^4.$$

As $h = .01$ we find that in the worst case that is in integrating from $x = 11.50\ (.01)\ 12.00$ the error is less than 2.10^{-7}, whereas e.g. for $x = 4.50(.01)5.00$ the error is less than 2.10^{-10}.

More serious is the influence of the rounding-off errors. As we took our integrand in only 5 decimals, it might theoretically occur that the error in the integral increased or decreased by 5.10^{-8} at each step continuously. Keeping this in mind, it is possible to construct from the known errors on both sides of each large interval, viz. 0 at x_0 and a few units of the 7th decimal at $x = x_0 + 50\,h$, the limits between which the rounding-off error is certainly restricted. In the middle of the interval these limits are rather wide, e.g. $\pm$ 15 units of the 7th decimal. We considered now a value of the function near the middle of the interval ending (in 7 decimals) on about 50, so that due to the uncertainty of the rounding-off error, rounding off to 5 decimals was uncertain. Such a function value was recalculated by means of the series. This new information drastically narrows the limits of uncertainty. Other doubtful values were then recalculated and so on, until for each value of u between 0 and 5 the last digit of the functions in five decimals was beyond doubt. For values of u beyond 5 the differences of the functions become so large that errors of one unit of the 7th decimal cannot longer be located with certainty by differencing. Moreover a slight influence of the remainderterm creeps in. Therefore, the foregoing process becomes less effective. Therefore, for $u = 5(.01)12$ all functionvalues were recalculated by means of the asymptotic series in 7 decimals and compared with the values found by numerical integration. In all cases where the functions ended on about 50 they were recomputed with higher precision until for $u = 5(.01)12$ the last digit of the 5-decimal table was guaranteed.

The part of the table for $u = 12(.01)20$ was calculated by means of the asymptotic series and checked by complete duplication of the computation.

The $\sin \frac{\pi}{2} u^2$ and $\cos \frac{\pi}{2} u^2$ were now taken in 6 decimals and the asymptotic series was computed to 8 decimals. Then only the values ending in 7 decimals exactly on 50 had to be recalculated with higher precision. This part of the table was again differenced but only to provide us with the necessary differences. We stress the point that even with this small interval for such high values of the argument no other method than complete duplication of the computation seems to check the function values sufficiently.

The differences are much too high to locate even moderately large errors with certainty, numerical integration is either subjected to very large remainderterm errors or else becomes clumsy, whereas the check of the smoothness of the function $(C-\frac{1}{2})^2 + (S-\frac{1}{2})^2$ is completely unsatisfactory. It does not only leave the endfigures unchecked if either $\cos \frac{\pi}{2} u^2$ or $\sin \frac{\pi}{2} u^2$ is near to zero, but it cannot detect any errors due to taking the wrong argument in these $\cos \frac{\pi}{2} u^2$ and $\sin \frac{\pi}{2} u^2$, or in particular taking one or both with the wrong sign or interchanging them. All these errors leave the said combination unchanged whereas nevertheless flagrant errors may be present in $C(u)$ and $S(u)$.

For the purpose of interpolation we computed modified second differences $\delta^{2*} = \delta^2 - 0.184\ \delta^4$ from the 7-decimal tables. They were rounded off to five decimals and checked by differencing.

3. *Interpolation in the table.* Linear interpolation will yield no larger error than $4 \times 10^{-5} \times u$. To get full profit of the accuracy of the table it is advisable to use EVERETT's formula up to second (modified) differences:

$$f(x_0 + p\,h) = (1-p)\,f_0 + p\,f_1 + E_0^2\,\delta_0^{2*} + E_1^2\,\delta_1^{2*} \ . \ . \ . \quad (3,1)$$

The modified second differences δ^{2*} are given alongside the function, whereas a small table of the interpolation polynomials E_0^2 and E_1^2 is given below for the convenience of the user. Even at the end of the table the error introduced by using (3,1) will not exceed 6×10^{-6}.

$-10^4 \times E_0^2$

p	0	1	2	3	4	5	6	7	8	9	*0	
0.0	0	33	65	96	125	154	182	209	236	261	285	0.9
0.1	285	308	331	352	373	393	412	430	448	464	480	0.8
0.2	480	495	509	522	535	547	558	568	578	587	595	0.7
0.3	595	602	609	615	621	626	630	633	636	638	640	0.6
0.4	640	641	641	641	641	639	638	635	632	629	625	0.5
0.5	625	621	616	610	604	598	591	584	577	568	560	0.4
0.6	560	551	542	532	522	512	501	490	479	467	455	0.3
0.7	455	443	430	417	404	391	377	363	349	335	320	0.2
0.8	320	305	290	275	260	244	229	213	197	181	165	0.1
0.9	165	149	132	116	100	83	67	50	33	17	0	0.0
	*0	9	8	7	6	5	4	3	2	1	0	p

$-10^4 \times E_1^2$

u	C(u)	δ^{2*}	S(u)	δ^{2*}	u	C(u)	δ^{2*}	S(u)	δ^{2*}
	0.		0.			0.		0.	
0.00	00000	0	00000	0	0.50	49234 − 6		06473	15
1	01000	0	00000	0	1	50155 − 6		06863	15
2	02000	0	00000	0	2	51070 − 7		07268	15
3	03000	0	00001	1	3	51977 − 7		07687	15
4	04000	0	00003	1	4	52878 − 7		08122	15
0.05	05000	0	00007	2	0.55	53771 − 8		08572	15
6	06000	0	00011	2	6	54656 − 8		09037	15
7	07000	0	00018	2	7	55533 − 9		09518	16
8	08000	0	00027	2	8	56401 − 9		10014	16
9	09000	0	00038	3	9	57260 −10		10526	16
0.10	10000	0	00052	3	0.60	58110 −10		11054	16
1	11000	0	00070	3	1	58949 −11		11598	16
2	11999	0	00090	4	2	59777 −11		12158	16
3	12999	0	00115	4	3	60595 −12		12733	16
4	13999	0	00144	4	4	61401 −12		13325	16
0.15	14998	0	00177	5	0.65	62195 −13		13933	16
6	15997	0	00214	5	6	62976 −13		14557	16
7	16996	0	00257	5	7	63745 −14		15197	16
8	17995	0	00305	6	8	64499 −14		15854	16
9	18994	0	00359	6	9	65240 −15		16526	16
0.20	19992	0	00419	6	0.70	65965 −15		17214	16
1	20990	0	00485	7	1	66676 −16		17917	16
2	21987 − 1		00557	7	2	67370 −16		18637	16
3	22984 − 1		00637	7	3	68048 −17		19372	15
4	23980 − 1		00723	8	4	68709 −18		20122	15
0.25	24976 − 1		00818	8	0.75	69353 −18		20888	15
6	25971 − 1		00920	8	6	69978 −19		21668	15
7	26965 − 1		01030	8	7	70584 −19		22463	14
8	27958 − 1		01148	9	8	71171 −20		23273	14
9	28949 − 1		01275	9	9	71738 −21		24097	14
0.30	29940 − 1		01412	9	0.80	72284 −21		24934	13
1	30929 − 1		01557	10	1	72810 −22		25785	13
2	31917 − 2		01713	10	2	73313 −22		26649	13
3	32904 − 2		01878	10	3	73794 −23		27526	12
4	33888 − 2		02053	10	4	74252 −24		28415	12
0.35	34871 − 2		02239	11	0.85	74686 −24		29316	11
6	35851 − 2		02436	11	6	75096 −25		30228	11
7	36829 − 2		02643	11	7	75481 −25		31151	10
8	37805 − 3		02863	12	8	75841 −26		32084	10
9	38778 − 3		03093	12	9	76175 −26		33026	9
0.40	39748 − 3		03336	12	0.90	76482 −27		33978	8
1	40715 − 3		03591	12	1	76763 −28		34937	8
2	41679 − 4		03858	13	2	77016 −28		35905	7
3	42639 − 4		04138	13	3	77240 −29		36879	6
4	43595 − 4		04431	13	4	77437 −29		37860	5
0.45	44547 − 4		04737	13	0.95	77604 −29		38846	5
6	45494 − 5		05056	14	6	77742 −30		39836	4
7	46437 − 5		05390	14	7	77849 −30		40830	3
8	47375 − 5		05737	14	8	77927 −31		41827	2
9	48308 − 6		06098	14	9	77974 −31		42826	1
0.50	49234 − 6		06473	15	1.00	77989 −31		43826	0

u	C(u)	δ^{2*}	S(u)	δ^{2*}	u	C(u)	δ^{2*}	S(u)	δ^{2*}
	0.		0.			0.		0.	
1.00	77989	−31	43826	0	1.50	44526	18	69750	−44
1	77974	−32	44826	− 1	1	43612	20	69346	−43
2	77926	−32	45825	− 2	2	42717	22	68899	−42
3	77847	−32	46821	− 3	3	41845	25	68409	−41
4	77735	−32	47815	− 4	4	40998	27	67879	−40
1.05	77591	−33	48805	− 5	1.55	40177	29	67308	−39
6	77414	−33	49789	− 6	6	39385	31	66697	−38
7	77205	−33	50767	− 8	7	38624	33	66049	−37
8	76963	−33	51737	− 9	8	37896	35	65363	−35
9	76688	−33	52698	−10	9	37203	37	64643	−34
1.10	76381	−33	53650	−11	1.60	36546	39	63889	−32
1	76040	−33	54590	−12	1	35928	41	63103	−30
2	75668	−32	55518	−14	2	35351	42	62286	−28
3	75262	−32	56432	−15	3	34816	44	61441	−26
4	74825	−32	57331	−16	4	34325	46	60570	−24
1.15	74356	−32	58214	−18	1.65	33880	47	59675	−22
6	73855	−31	59080	−19	6	33481	48	58758	−20
7	73323	−31	59926	−20	7	33131	50	57821	−17
8	72760	−30	60753	−21	8	32831	51	56868	−15
9	72167	−30	61558	−23	9	32581	52	55900	−12
1.20	71544	−29	62340	−24	1.70	32383	53	54920	− 9
1	70892	−28	63098	−25	1	32237	53	53930	− 6
2	70212	−28	63831	−27	2	32145	54	52935	− 4
3	69504	−27	64538	−28	3	32107	54	51936	− 1
4	68769	−26	65216	−29	4	32123	55	50936	2
1.25	68009	−25	65866	−30	1.75	32194	55	49938	5
6	67224	−24	66485	−32	6	32319	55	48946	8
7	66415	−23	67072	−33	7	32499	54	47963	12
8	65583	−22	67627	−34	8	32733	54	46991	15
9	64729	−20	68148	−35	9	33022	53	46034	18
1.30	63855	−19	68633	−36	1.80	33363	53	45094	21
1	62962	−18	69083	−37	1	33758	52	44175	24
2	62051	−16	69496	−38	2	34203	50	43280	27
3	61124	−15	69870	−39	3	34700	49	42412	30
4	60182	−13	70205	−40	4	35245	48	41574	33
1.35	59227	−12	70501	−41	1.85	35838	46	40769	36
6	58260	−10	70756	−42	6	36476	44	39999	39
7	57283	− 8	70969	−42	7	37159	42	39269	41
8	56298	− 6	71140	−43	8	37883	39	38579	44
9	55306	− 5	71268	−43	9	38647	37	37934	46
1.40	54310	− 3	71352	−44	1.90	39447	34	37335	49
1	53310	− 1	71393	−44	1	40282	31	36785	51
2	52311	1	71390	−45	2	41148	29	36285	53
3	51312	3	71342	−45	3	42043	25	35839	55
4	50316	5	71249	−45	4	42963	22	35448	57
1.45	49326	7	71111	−45	1.95	43906	19	35114	58
6	48343	9	70928	−45	6	44867	15	34838	60
7	47369	12	70700	−45	7	45843	11	34622	61
8	46407	14	70428	−44	8	46831	8	34467	62
9	45459	16	70111	−44	9	47826	4	34373	62
1.50	44526	18	69750	−44	2.00	48825	0	34342	63

u	C(u)	δ^{2*}	S(u)	δ^{2*}	u	C(u)	δ^{2*}	S(u)	δ^{2*}
	0.		0.			0.		0.	
2.00	48825	0	34342	63	2.50	45741	30	61918	−73
1	49825	− 4	34373	63	1	44833	36	61500	−70
2	50820	− 8	34467	63	2	43961	41	61011	−67
3	51807	−12	34625	63	3	43131	47	60455	−64
4	52783	−16	34845	62	4	42347	52	59834	−61
2.05	53742	−20	35127	61	2.55	41615	57	59153	−56
6	54681	−24	35470	60	6	40940	61	58416	−52
7	55596	−28	35873	59	7	40326	66	57627	−47
8	56483	−32	36335	57	8	39778	70	56790	−42
9	57338	−36	36854	55	9	39299	73	55913	−36
2.10	58156	−40	37427	53	2.60	38894	76	54999	−30
1	58936	−43	38054	50	1	38564	78	54055	−24
2	59672	−47	38730	48	2	38313	81	53088	−17
3	60361	−50	39454	45	3	38142	82	52103	−11
4	61001	−53	40223	41	4	38053	83	51107	− 4
2.15	61587	−56	41033	38	2.65	38047	83	50107	3
6	62117	−59	41880	34	6	38123	83	49110	10
7	62589	−61	42762	30	7	38283	82	48123	17
8	63000	−63	43674	26	8	38525	81	47153	24
9	63347	−65	44611	22	9	38848	79	46207	31
2.20	63629	−67	45570	17	2.70	39249	76	45292	37
1	63844	−68	46547	13	1	39727	73	44413	44
2	63990	−69	47536	8	2	40277	69	43579	50
3	64068	−70	48533	3	3	40897	65	42794	56
4	64075	−70	49532	− 2	4	41582	60	42066	62
2.25	64012	−70	50530	− 7	2.75	42326	55	41399	67
6	63879	−70	51521	−12	6	43126	49	40799	72
7	63676	−69	52500	−17	7	43974	43	40270	76
8	63404	−68	53462	−22	8	44865	36	39817	79
9	63063	−67	54402	−27	9	45793	29	39444	83
2.30	62656	−65	55315	−32	2.80	46749	22	39153	85
1	62184	−63	56196	−37	1	47727	14	38947	87
2	61649	−60	57041	−41	2	48720	7	38828	88
3	61055	−57	57845	−46	3	49719	− 1	38798	89
4	60403	−54	58603	−50	4	50717	− 9	38856	89
2.35	59697	−50	59311	−54	2.85	51706	−17	39004	88
6	58941	−46	59965	−58	6	52678	−25	39238	86
7	58138	−42	60561	−61	7	53624	−33	39560	84
8	57293	−38	61096	−65	8	54538	−40	39965	81
9	56411	−33	61566	−68	9	55412	−48	40451	77
2.40	55496	−28	61969	−70	2.90	56238	−55	41014	73
1	54553	−22	62302	−72	1	57009	−61	41650	68
2	53588	−17	62562	−74	2	57719	−68	42354	62
3	52606	−11	62748	−76	3	58361	−73	43120	56
4	51612	− 6	62859	−76	4	58931	−78	43941	49
2.45	50613	0	62894	−77	2.95	59422	−83	44812	42
6	49614	6	62851	−77	6	59830	−87	45724	34
7	48622	12	62732	−77	7	60152	−90	46671	26
8	47641	18	62536	−76	8	60385	−92	47643	18
9	46679	24	62264	−74	9	60525	−94	48633	9
2.50	45741	30	61918	−73	3.00	60572	−94	49631	0

u	C(u)	δ^2*	S(u)	δ^2*	u	C(u)	δ^2*	S(u)	δ^2*
	0.		0.			0.		0.	
3.00	60572	−94	49631	0	3.50	53257	− 42	41525	102
1	60525	−94	50630	− 9	1	54158	− 53	41958	97
2	60384	−93	51619	−18	2	55006	− 64	42487	91
3	60149	−91	52591	−27	3	55790	− 73	43106	83
4	59824	−89	53536	−35	4	56501	− 82	43809	75
3.05	59410	−85	54446	−44	3.55	57130	− 90	44586	65
6	58910	−81	55312	−52	6	57668	− 97	45428	55
7	58330	−76	56126	−60	7	58109	−103	46325	44
8	57674	−70	56880	−67	8	58446	−108	47266	32
9	56948	−63	57568	−74	9	58676	−111	48239	20
3.10	56159	−56	58182	−80	3.60	58795	−113	49231	7
1	55315	−48	58716	−85	1	58802	−113	50230	− 6
2	54422	−40	59165	−90	2	58695	−112	51224	− 19
3	53489	−31	59525	−93	3	58476	−110	52199	− 31
4	52526	−22	59791	−96	4	58147	−106	53143	− 44
3.15	51541	−12	59962	−98	3.65	57713	−100	54043	− 56
6	50544	− 2	60034	−99	6	57179	− 94	54888	− 67
7	49544	8	60007	−99	7	56551	− 86	55666	− 78
8	48553	18	59880	−98	8	55838	− 76	56366	− 87
9	47579	27	59656	−97	9	55049	− 66	56980	− 96
3.20	46632	37	59335	−94	3.70	54195	− 54	57498	−103
1	45722	46	58921	−90	1	53286	− 42	57914	−109
2	44859	55	58417	−85	2	52334	− 29	58221	−113
3	44051	64	57829	−79	3	51354	− 16	58415	−116
4	43307	72	57161	−72	4	50358	− 2	58493	−118
3.25	42634	79	56422	−65	3.75	49359	12	58453	−117
6	42040	85	55618	−57	6	48372	25	58297	−116
7	41532	91	54758	−48	7	47410	39	58025	−112
8	41114	96	53849	−38	8	46487	52	57642	−107
9	40792	99	52903	−28	9	45616	64	57152	−100
3.30	40569	102	51929	−18	3.80	44809	76	56562	− 92
1	40449	104	50936	− 7	1	44079	87	55880	− 83
2	40432	104	49937	4	2	43435	96	55116	− 72
3	40519	104	48941	15	3	42887	104	54280	− 60
4	40710	102	47960	25	4	42443	111	53384	− 47
3.35	41002	99	47004	36	3.85	42111	116	52442	− 33
6	41394	95	46084	46	6	41894	120	51466	− 19
7	41880	90	45211	56	7	41798	122	50472	− 4
8	42455	84	44394	66	8	41822	122	49472	10
9	43114	76	43642	74	9	41968	120	48484	25
3.40	43849	68	42965	82	3.90	42233	116	47520	40
1	44652	59	42370	89	1	42614	111	46596	54
2	45514	49	41864	96	2	43106	103	45726	67
3	46426	39	41454	101	3	43700	95	44923	80
4	47376	28	41144	105	4	44389	84	44199	91
3.45	48354	17	40938	107	3.95	45162	72	43566	101
6	49349	5	40839	109	6	46008	60	43033	109
7	50348	− 7	40849	109	7	46913	46	42609	116
8	51341	−19	40968	108	8	47864	31	42301	121
9	52314	−31	41194	105	9	48845	16	42114	125
3.50	53257	−42	41525	102	4.00	49843	0	42052	126

u	C(u)	δ^{2*}	S(u)	δ^{2*}	u	C(u)	δ^{2*}	S(u)	δ^{2*}
	0.		0.			0.		0.	
4.00	49843	0	42052	126	4.50	52603	− 54	43427	131
1	50840	− 16	42114	125	1	53496	− 72	43874	122
2	51822	− 32	42302	122	2	54318	− 89	44442	111
3	52772	− 47	42612	118	3	55051	−104	45121	97
4	53675	− 62	43039	111	4	55680	−117	45897	82
4.05	54517	− 75	43577	103	4.55	56193	−128	46755	65
6	55284	− 88	44218	93	6	56578	−136	47677	46
7	55963	− 99	44951	81	7	56828	−142	48644	26
8	56543	−109	45764	68	8	56937	−144	49638	5
9	57015	−117	46646	53	9	56902	−144	50636	− 15
4.10	57370	−123	47580	38	4.60	56724	−140	51619	− 36
1	57601	−127	48552	22	1	56406	−134	52566	− 56
2	57706	−130	49546	5	2	55955	−125	53458	− 75
3	57681	−129	50545	− 12	3	55379	−113	54275	− 92
4	57528	−127	51532	− 28	4	54692	− 98	55000	−108
4.15	57247	−123	52491	− 45	4.65	53906	− 82	55617	−121
6	56845	−116	53406	− 60	6	53039	− 63	56113	−132
7	56326	−107	54260	− 75	7	52109	− 44	56478	−140
8	55701	− 97	55039	− 89	8	51135	− 23	56702	−146
9	54979	− 85	55730	−101	9	50139	− 1	56782	−148
4.20	54172	− 71	56320	−112	4.70	49143	21	56715	−147
1	53295	− 56	56798	−120	1	48167	42	56501	−142
2	52362	− 39	57157	−127	2	47233	63	56146	−135
3	51390	− 22	57390	−131	3	46362	82	55657	−124
4	50396	− 5	57491	−133	4	45572	100	55045	−111
4.25	49397	13	57460	−133	4.75	44883	116	54322	− 95
6	48412	31	57295	−130	6	44308	129	53504	− 77
7	47457	48	57001	−126	7	43862	139	52610	− 57
8	46550	65	56582	−118	8	43554	146	51660	− 36
9	45707	80	56045	−109	9	43392	150	50674	− 13
4.30	44944	94	55400	− 97	4.80	43380	151	49675	9
1	44275	107	54657	− 84	1	43517	148	48686	32
2	43712	117	53832	− 69	2	43802	142	47728	54
3	43267	126	52937	− 52	3	44229	132	46824	75
4	42946	132	51991	− 35	4	44787	120	45996	94
4.35	42758	136	51010	− 17	4.85	45464	104	45261	112
6	42704	137	50012	2	6	46244	86	44638	127
7	42788	136	49016	21	7	47111	66	44140	138
8	43007	132	48041	39	8	48043	44	43781	147
9	43357	126	47105	57	9	49019	21	43568	153
4.40	43833	117	46227	74	4.90	50016	− 3	43507	154
1	44426	106	45422	90	1	51011	− 26	43599	152
2	45124	93	44707	104	2	51980	− 49	43843	147
3	45914	78	44095	116	3	52899	− 72	44234	138
4	46781	61	43599	126	4	53747	− 92	44762	125
4.45	47709	43	43229	133	4.95	54404	−111	45414	110
6	48679	24	42991	138	6	55150	−127	46176	91
7	49674	4	42891	141	7	55671	−140	47028	71
8	50672	− 16	42931	140	8	56052	−149	47952	48
9	51655	− 35	43111	137	9	56285	−155	48923	25
4.50	52603	− 54	43427	131	5.00	56363	−158	49919	0

u	C(u)	δ^{2*}	S(u)	δ^{2*}	u	C(u)	δ^{2*}	S(u)	δ^{2*}
	0.		0.			0.		0.	
5.00	56363	−158	49919	0	5.50	47842	66	55368	−160
1	56285	−156	50915	− 25	1	46956	93	54908	−147
2	56051	−150	51886	− 49	2	46162	117	54302	−129
3	55668	−141	52809	− 72	3	45485	138	53568	−107
4	55144	−128	53660	− 94	4	44945	154	52728	− 81
5.05	54493	−112	54417	−113	5.55	44558	167	51807	− 53
6	53730	− 93	55062	−129	6	44337	174	50833	− 24
7	52875	− 71	55579	−143	7	44289	175	49835	7
8	51949	− 48	55953	−153	8	44415	172	48844	37
9	50975	− 23	56175	−159	9	44712	163	47891	67
5.10	49978	3	56239	−161	5.60	45171	149	47004	95
1	48984	28	56143	−158	1	45779	130	46211	119
2	48018	53	55890	−152	2	46515	108	45537	141
3	47104	77	55485	−142	3	47359	81	45002	158
4	46268	99	54939	−128	4	48284	52	44625	170
5.15	45530	119	54266	−111	5.65	49260	22	44416	177
6	44911	135	53482	− 90	6	50259	− 10	44383	178
7	44426	148	52609	− 67	7	51247	− 41	44528	174
8	44088	158	51669	− 42	8	52194	− 72	44845	164
9	43908	163	50686	− 16	9	53069	−100	45325	149
5.20	43889	163	49688	10	5.70	53846	−125	45953	129
1	44033	160	48699	37	1	54498	−146	46709	105
2	44336	152	47747	63	2	55005	−163	47570	77
3	44790	140	46858	87	3	55349	−174	48507	47
4	45384	124	46054	109	4	55521	−180	49491	15
5.25	46101	105	45359	128	5.75	55513	−180	50489	− 18
6	46923	83	44792	144	6	55326	−175	51470	− 50
7	47827	58	44367	156	7	54965	−163	52402	− 81
8	48788	32	44096	163	8	54442	−146	53253	−109
9	49781	4	43989	167	9	53775	−124	53995	−134
5.30	50779	− 24	44047	165	5.80	52984	− 98	54605	−154
1	51752	− 51	44269	159	1	52095	− 68	55061	−170
2	52676	− 77	44650	149	2	51139	− 37	55348	−180
3	53523	−101	45180	134	3	50146	− 3	55457	−184
4	54270	−122	45843	116	4	49150	30	55383	−182
5.35	54895	−140	46622	94	5.85	48185	63	55128	−173
6	55382	−154	47494	70	6	47282	94	54702	−159
7	55715	−164	48435	43	7	46472	122	54117	−139
8	55886	−169	49419	15	8	45784	145	53394	−115
9	55889	−169	50418	− 14	9	45240	164	52556	− 86
5.40	55723	−165	51403	− 42	5.90	44859	178	51633	− 55
1	55394	−156	52346	− 70	1	44655	185	50656	− 21
2	54910	−142	53220	− 95	2	44635	186	49657	14
3	54284	−124	53998	−118	3	44800	181	48672	48
4	53536	−102	54660	−138	4	45145	169	47735	81
5.45	52686	− 77	55184	−153	5.95	45657	151	46878	111
6	51759	− 50	55556	−165	6	46320	128	46131	137
7	50782	− 21	55765	−171	7	47110	101	45521	159
8	49784	8	55803	−172	8	48000	69	45068	175
9	48794	38	55670	−169	9	48959	35	44790	186
5.50	47842	66	55368	−160	6.00	49953	0	44696	189

u	$C(u)$	δ^2*	$S(u)$	δ^2*	u	$C(u)$	δ^2*	$S(u)$	δ^2*
	0.		0.			0.		0.	
6.00	49953	0	44696	189	6.50	48160	78	54538	−189
1	50947	− 36	44790	186	1	47282	115	54064	−170
2	51906	− 70	45069	176	2	46518	148	53421	−143
3	52795	−102	45523	160	3	45901	174	52636	−110
4	53583	−131	46137	139	4	45456	193	51743	− 72
6.05	54241	−155	46888	111	6.55	45203	204	50777	− 31
6	54745	−173	47750	80	6	45153	207	49780	12
7	55077	−186	48691	46	7	45308	200	48794	53
8	55225	−191	49679	10	8	45662	186	47860	93
9	55182	−190	50676	− 26	9	46200	163	47019	129
6.10	54950	−182	51648	− 62	6.60	46899	133	46307	160
1	54538	−167	52557	− 96	1	47730	97	45754	185
2	53960	−146	53371	−126	2	48657	57	45384	201
3	53236	−119	54059	−152	3	49641	14	45213	209
4	52395	− 88	54597	−172	4	50638	− 29	45249	207
6.15	51466	− 53	54963	−186	6.65	51606	− 72	45492	197
6	50484	− 17	55144	−194	6	52504	−111	45929	178
7	49486	21	55132	−193	7	53290	−146	46544	151
8	48508	58	54929	−186	8	53932	−175	47309	118
9	47588	93	54541	−172	9	54400	−196	48190	79
6.20	46761	125	53982	−151	6.70	54674	−208	49150	36
1	46057	152	53274	−124	1	54741	−211	50146	− 8
2	45504	173	52443	− 92	2	54598	−206	51134	− 52
3	45123	188	51520	− 57	3	54252	−190	52070	− 94
4	44928	196	50541	− 19	4	53717	−167	52913	−132
6.25	44929	196	49542	19	6.75	53017	−135	53624	−165
6	45123	189	48563	57	6	52182	− 98	54172	−190
7	45506	174	47641	93	7	51251	− 55	54532	−206
8	46061	153	46811	126	8	50265	− 11	54687	−214
9	46769	125	46107	154	9	49269	35	54630	−211
6.30	47600	93	45555	176	6.80	48307	79	54364	−200
1	48525	57	45177	191	1	47423	120	53899	−179
2	49505	18	44989	198	2	46659	155	53258	−149
3	50503	− 22	44997	198	3	46048	184	52469	−113
4	51480	− 61	45203	191	4	45619	204	51567	− 71
6.35	52397	− 97	45598	175	6.85	45392	215	50595	− 26
6	53217	−130	46167	153	6	45378	216	49598	20
7	53909	−158	46888	124	7	45578	207	48620	66
8	54443	−180	47731	90	8	45982	188	47707	109
9	54798	−195	48664	53	9	46573	160	46903	147
6.40	54960	−202	49649	13	6.90	47323	125	46244	178
1	54923	−200	50647	− 28	1	48196	84	45762	201
2	54686	−191	51617	− 67	2	49154	39	45479	215
3	54260	−174	52520	−105	3	50149	− 9	45410	219
4	53662	−149	53319	−137	4	51136	− 56	45557	212
6.45	52915	−119	53981	−165	6.95	52068	−100	45914	195
6	52050	− 83	54480	−186	6	52901	−140	46465	169
7	51103	− 44	54794	−199	7	53594	−174	47183	135
8	50111	− 3	54910	−204	8	54114	−199	48034	94
9	49117	38	54824	−201	9	54437	−215	48979	48
6.50	48160	78	54538	−189	7.00	54547	−221	49970	0

u	C(u)	δ^{2*}	S(u)	δ^{2*}	u	C(u)	δ^{2*}	S(u)	δ^{2*}
	0.		0.			0.		0.	
7.00	54547	−221	49970	0	7.50	51602	− 91	46070	219
1	54437	−216	50962	− 48	1	52472	−139	46558	192
2	54114	−200	51906	− 94	2	53205	−181	47235	154
3	53591	−175	52757	−136	3	53758	−212	48065	108
4	52895	−141	53472	−172	4	54102	−232	49002	55
7.05	52060	−100	54017	−199	7.55	54216	−239	49993	− 1
6	51124	− 54	54366	−216	6	54094	−232	50983	− 57
7	50135	− 5	54500	−223	7	53742	−212	51917	−110
8	49141	44	54413	−219	8	53181	−181	52741	−157
9	48191	91	54108	−204	9	52440	−138	53410	−196
7.10	47331	135	53602	−179	7.60	51563	− 88	53885	−223
1	46605	171	52917	−145	1	50598	− 33	54139	−238
2	46048	199	52089	−104	2	49601	24	54158	−240
3	45689	218	51158	− 57	3	48628	80	53939	−227
4	45546	225	50171	− 7	4	47734	132	53496	−202
7.15	45626	221	49176	43	7.65	46971	177	52853	−165
6	45925	207	48224	92	6	46384	211	52047	−118
7	46429	181	47363	136	7	46005	234	51124	− 64
8	47113	147	46636	173	8	45858	243	50137	− 7
9	47942	104	46081	202	9	45951	237	49144	52
7.20	48874	57	45725	220	7.70	46278	219	48201	107
1	49863	6	45588	228	1	46822	187	47365	156
2	50857	− 46	45676	223	2	47551	144	46684	197
3	51805	− 95	45985	208	3	48421	92	46197	226
4	52660	−139	46500	181	4	49384	35	45934	242
7.25	53377	−177	47194	145	7.75	50381	− 24	45911	244
6	53918	−205	48033	102	6	51354	− 82	46128	231
7	54256	−223	48972	53	7	52247	−136	46575	205
8	54372	−230	49963	1	8	53004	−181	47223	166
9	54260	−224	50954	− 52	9	53583	−216	48036	117
7.30	53927	−207	51895	−101	7.80	53947	−239	48965	61
1	53388	−179	52735	−146	1	54075	−247	49954	2
2	52672	−141	53430	−183	2	53959	−240	50944	− 59
3	51817	− 96	53944	−211	3	53606	−219	51877	−115
4	50867	− 45	54249	−227	4	53036	−184	52696	−165
7.35	49872	8	54329	−232	7.85	52283	−139	53351	−206
6	48886	61	54179	−224	6	51394	− 84	53802	−234
7	47960	111	53807	−205	7	50421	− 25	54022	−247
8	47144	155	53232	−174	8	49424	37	53998	−247
9	46483	191	52485	−134	9	48463	96	53730	−230
7.40	46010	217	51607	− 86	7.90	47597	150	53234	−200
1	45753	232	50643	− 34	1	46880	195	52541	−157
2	45725	233	49645	21	2	46355	228	51693	−104
3	45928	223	48668	74	3	46055	247	50742	− 45
4	46352	200	47765	124	4	45999	250	49746	17
7.45	46974	166	46985	167	7.95	46191	239	48767	79
6	47759	123	46369	201	6	46618	212	47866	135
7	48666	73	45953	224	7	47256	172	47099	184
8	49645	18	45760	236	8	48063	121	46513	221
9	50642	− 37	45799	234	9	48991	63	46146	245
7.50	51602	− 91	46070	219	8.00	49980	0	46021	253

u	C(u)	δ^2*	S(u)	δ^2*	u	C(u)	δ^2*	S(u)	δ^2*
	0.		0.			0.		0.	
8.00	49980	0	46021	253	8.50	51418	−103	46534	248
1	50970	− 63	46146	245	1	52280	−165	47035	213
2	51897	−122	46514	222	2	52979	−216	47746	162
3	52703	−174	47101	185	3	53465	−251	48616	99
4	53337	−215	47871	136	4	53704	−269	49584	29
8.05	53759	−242	48774	78	8.55	53677	−267	50581	− 43
6	53941	−254	49755	15	6	53387	−246	51535	−113
7	53872	−250	50750	− 50	7	52854	−208	52377	−174
8	53556	−230	51696	−111	8	52116	−154	53047	−224
9	53012	−195	52532	−166	9	51226	− 89	53497	−257
8.10	52275	−147	53204	−210	8.60	50248	− 17	53693	−272
1	51393	− 90	53669	−240	1	49254	56	53621	−267
2	50422	− 26	53897	−255	2	48315	125	53286	−242
3	49425	39	53873	−254	3	47500	186	52712	−200
4	48467	102	53597	−236	4	46868	233	51940	−143
8.15	47609	159	53088	−203	8.65	46467	263	51028	− 75
6	46908	205	52378	−156	6	46325	274	50041	− 2
7	46410	238	51514	− 99	7	46453	265	49052	72
8	46148	256	50552	− 36	8	46843	236	48135	141
9	46139	257	49555	31	9	47465	189	47356	199
8.20	46384	241	48588	95	8.70	48274	129	46774	243
1	46867	209	47716	154	1	49211	58	46432	269
2	47557	163	46996	203	2	50205	− 17	46356	275
3	48408	106	46475	238	3	51182	− 91	46551	261
4	49363	42	46190	257	4	52070	−158	47004	227
8.25	50360	− 26	46159	260	8.75	52802	−214	47681	176
6	51332	− 91	46384	245	6	53323	−254	48531	111
7	52213	−151	46851	213	7	53593	−275	49490	38
8	52944	−201	47529	168	8	53592	−275	50487	− 38
9	53477	−238	48372	110	9	53320	−255	51446	−112
8.30	53775	−259	49323	45	8.80	52796	−215	52294	−177
1	53817	−262	50320	− 23	1	52061	−158	52967	−230
2	53601	−247	51293	− 90	2	51170	− 90	53414	−264
3	53140	−216	52177	−151	3	50191	− 14	53600	−279
4	52466	−170	52913	−202	4	49198	63	53510	−273
8.35	51625	−112	53448	−239	8.85	48268	136	53152	−245
6	50674	− 46	53747	−260	6	47472	198	52552	−198
7	49678	24	53789	−264	7	46871	245	51757	−137
8	48705	91	53571	−249	8	46512	274	50827	− 64
9	47822	153	53106	−217	9	46423	281	49834	14
8.40	47091	205	52428	−169	8.90	46612	267	48855	91
1	46562	242	51583	−110	1	47063	231	47966	161
2	46273	263	50629	− 43	2	47742	178	47237	219
3	46242	265	49633	27	3	48597	110	46724	260
4	46474	249	48663	96	4	49560	34	46467	281
8.45	46951	216	47788	158	8.95	50556	− 45	46487	280
6	47642	167	47068	209	6	51508	−121	46783	256
7	48497	106	46556	246	7	52340	−188	47332	213
8	49457	38	46286	266	8	52986	−240	48091	152
9	50454	− 34	46279	267	9	53396	−273	48999	79
8.50	51418	−103	46534	248	9.00	53537	−285	49986	0

u	C(u)	δ^2*	S(u)	δ^2*	u	C(u)	δ^2*	S(u)	δ^2*
	0.		0.			0.		0.	
9.00	53537	−285	49986	0	9.50	48729	115	53100	−278
1	53396	−274	50973	− 80	1	47875	192	52586	−232
2	52986	−241	51881	−153	2	47211	252	51844	−166
3	52338	−189	52638	−215	3	46795	290	50939	− 84
4	51504	−121	53184	−259	4	46664	303	49951	5
9.05	50550	− 44	53474	−283	9.55	46831	288	48969	95
6	49553	38	53485	−284	6	47280	247	48080	176
7	48594	116	53215	−263	7	47973	184	47363	241
8	47749	185	52687	−220	8	48846	104	46884	285
9	47087	240	51942	−159	9	49822	15	46686	304
9.10	46661	275	51041	− 85	9.60	50813	− 76	46786	295
1	46507	288	50057	− 4	1	51730	−160	47176	259
2	46636	278	49069	78	2	52489	−230	47821	200
3	47040	245	48158	154	3	53022	−280	48662	123
4	47685	192	47398	217	4	53280	−304	49624	34
9.15	48519	122	46852	263	9.65	53240	−300	50620	− 59
6	49474	43	46565	287	6	52904	−269	51558	−146
7	50470	− 40	46561	288	7	52303	−214	52352	−220
8	51427	−121	46840	265	8	51492	−138	52930	−274
9	52265	−191	47379	219	9	50545	− 50	53239	−303
9.20	52914	−246	48135	156	9.70	49549	43	53250	−304
1	53321	−281	49045	80	1	48595	133	52962	−278
2	53452	−292	50033	− 4	2	47772	210	52400	−225
3	53295	−279	51017	− 87	3	47156	269	51617	−152
4	52864	−243	51915	−164	4	46805	302	50685	− 64
9.25	52193	−186	52652	−227	9.75	46750	308	49691	30
6	51339	−113	53166	−271	6	46998	285	48726	122
7	50374	− 31	53413	−292	7	47525	235	47881	202
8	49378	54	53373	−289	8	48283	163	47235	264
9	48436	135	53049	−261	9	49201	75	46848	301
9.30	47627	205	52467	−212	9.80	50193	− 20	46758	310
1	47020	258	51676	−144	1	51166	−113	46972	290
2	46667	288	50745	− 63	2	52028	−196	47471	242
3	46598	295	49751	23	3	52697	−260	48209	172
4	46818	276	48779	107	4	53111	−300	49115	85
9.35	47311	233	47913	182	9.85	53230	−312	50104	− 11
6	48033	171	47226	243	6	53042	−294	51082	−106
7	48923	93	46778	282	7	52564	−248	51956	−191
8	49905	7	46608	297	8	51843	−178	52643	−258
9	50893	− 79	46730	287	9	50946	− 91	53076	−300
9.40	51804	−160	47134	252	9.90	49960	5	53215	−314
1	52558	−226	47786	194	1	48979	101	53045	−298
2	53089	−273	48629	120	2	48096	187	52583	−253
3	53350	−297	49591	35	3	47398	256	51873	−183
4	53320	−294	50587	− 53	4	46952	300	50982	− 96
9.45	53001	−266	51530	−137	9.95	46801	316	49998	1
6	52419	−215	52339	−209	6	46960	300	49015	98
7	51626	−144	52942	−263	7	47414	256	48128	186
8	50690	− 61	53286	−294	8	48119	186	47425	256
9	49696	28	53340	−299	9	49006	98	46973	301
9.50	48729	115	53100	−278	10.00	49990	0	46817	317

u	C(u)	δ^{2*}	S(u)	δ^{2*}	u	C(u)	δ^{2*}	S(u)	δ^{2*}
	0.		0.			0.		0.	
10.00	49990	0	46817	317	10.50	48848	128	52804	-308
1	50973	- 98	46973	302	1	48003	221	52277	-250
2	51861	-187	47425	257	2	47375	290	51505	-165
3	52564	-258	48130	187	3	47032	328	50571	- 62
4	53015	-303	49018	98	4	47010	331	49576	48
10.05	53167	-319	50002	- 1	10.55	47313	298	48627	153
6	53007	-303	50985	-100	6	47908	232	47830	242
7	52549	-257	51870	-190	7	48731	141	47269	305
8	51838	-185	52567	-261	8	49691	34	47007	334
9	50946	- 95	53009	-306	9	50685	- 77	47073	327
10.10	49960	5	53151	-320	10.60	51602	-180	47460	284
1	48980	105	52978	-303	1	52342	-264	48125	210
2	48102	194	52508	-255	2	52824	-318	48996	112
3	47415	265	51787	-182	3	52994	-338	49977	2
4	46989	309	50887	- 90	4	52834	-320	50959	-109
10.15	46866	322	49899	11	10.65	52360	-266	51834	-208
6	47058	302	48922	112	6	51624	-183	52505	-285
7	47548	252	48055	201	7	50710	- 80	52898	-329
8	48285	176	47385	271	8	49717	33	52967	-338
9	49195	82	46982	313	9	48756	143	52705	-308
10.20	50186	- 20	46885	323	10.70	47936	236	52142	-244
1	51157	-121	47105	300	1	47347	304	51340	-152
2	52010	-210	47621	247	2	47056	338	50388	- 44
3	52655	-278	48378	168	3	47096	333	49393	71
4	53029	-317	49301	72	4	47463	292	48468	177
10.25	53091	-324	50295	- 32	10.75	48115	217	47716	264
6	52836	-297	51257	-133	6	48980	117	47223	321
7	52289	-240	52089	-220	7	49959	4	47045	342
8	51507	-158	52705	-285	8	50942	-110	47201	324
9	50569	- 59	53041	-321	9	51817	-212	47676	269
10.30	49574	46	53061	-324	10.80	52484	-290	48414	184
1	48624	147	52763	-292	1	52868	-335	49332	77
2	47817	232	52179	-231	2	52924	-342	50326	- 39
3	47239	294	51369	-145	3	52645	-309	51281	-151
4	46950	325	50416	- 43	4	52064	-241	52089	-246
10.35	46980	322	49421	63	10.85	51246	-146	52656	-312
6	47326	286	48487	163	6	50286	- 33	52917	-344
7	47952	219	47714	246	7	49293	84	52842	-335
8	48793	129	47181	303	8	48383	192	52438	-288
9	49761	25	46946	329	9	47662	277	51754	-207
10.40	50752	- 82	47033	320	10.90	47211	331	50866	-102
1	51664	-181	47434	277	1	47085	346	49879	15
2	52398	-260	48107	204	2	47298	321	48907	131
3	52876	-312	48980	110	3	47825	259	48063	232
4	53049	-331	49960	3	4	48606	166	47446	306
10.45	52896	-315	50944	-104	10.95	49549	53	47128	344
6	52434	-265	51826	-200	6	50544	- 66	47147	342
7	51713	-186	52512	-275	7	51474	-178	47501	300
8	50808	- 88	52928	-321	8	52230	-269	48148	222
9	49818	21	53029	-332	9	52723	-329	49012	118
10.50	48848	128	52804	-308	11.00	52894	-350	49992	0

u	$C(u)$	δ^{2*}	$S(u)$	δ^{2*}	u	$C(u)$	δ^{2*}	$S(u)$	δ^{2*}
	0.		0.			0.		0.	
11.00	52894	−350	49992	0	11.50	51053	−140	47440	338
1	52723	−329	50973	−119	1	51889	−251	47980	267
2	52229	−270	51837	−223	2	52479	−329	48780	161
3	51472	−178	52482	−302	3	52748	−365	49738	34
4	50541	− 65	52832	−345	4	52660	−354	50728	− 98
11.05	49546	56	52845	−347	11.55	52227	−296	51623	−217
6	48606	171	52518	−307	6	51504	−200	52306	−309
7	47833	266	51890	−231	7	50586	− 78	52688	−360
8	47321	329	51038	−126	8	49592	56	52718	−364
9	47130	352	50061	− 7	9	48652	182	52393	−321
11.10	47285	334	49078	114	11.60	47890	284	51754	−235
1	47765	275	48207	222	1	47405	350	50886	−119
2	48515	183	47553	303	2	47262	370	49901	14
3	49443	68	47195	347	3	47480	340	48931	145
4	50438	− 55	47176	350	4	48031	266	48103	258
11.15	51379	−172	47500	310	11.65	48841	157	47526	336
6	52151	−268	48127	232	6	49803	26	47277	370
7	52661	−332	48981	126	7	50791	−109	47390	355
8	52847	−355	49959	4	8	51673	−229	47849	293
9	52685	−336	50940	−118	9	52332	−319	48594	191
11.20	52194	−274	51806	−227	11.70	52679	−367	49526	64
1	51436	−180	52450	−308	1	52668	−366	50520	− 72
2	50502	− 62	52792	−351	2	52300	−316	51444	−199
3	49507	63	52791	−351	3	51624	−223	52174	−300
4	48574	181	52447	−308	4	50731	−100	52611	−360
11.25	47817	277	51800	−227	11.75	49741	37	52697	−372
6	47331	338	50932	−117	6	48786	169	52419	−334
7	47176	358	49950	7	7	47996	278	51816	−251
8	47371	334	48974	131	8	47477	350	50967	−133
9	47893	268	48127	239	9	47300	375	49989	2
11.30	48676	168	47514	318	11.80	47490	349	49013	138
1	49623	47	47211	357	1	48020	276	48172	256
2	50617	− 80	47257	351	2	48819	164	47580	339
3	51533	−197	47645	302	3	49778	30	47318	375
4	52255	−290	48329	214	4	50767	−108	47423	361
11.35	52694	−347	49222	99	11.85	51650	−232	47880	297
6	52794	−360	50211	− 28	6	52306	−325	48627	192
7	52542	−328	51173	−152	7	52646	−373	49562	61
8	51969	−254	51987	−258	8	52621	−370	50556	− 79
9	51148	−148	52548	−331	9	52236	−316	51472	−209
11.40	50182	− 23	52786	−362	11.90	51543	−218	52185	−310
1	49194	106	52671	−347	1	50637	− 90	52595	−368
2	48310	221	52216	−288	2	49645	51	52647	−376
3	47641	309	51480	−192	3	48702	186	52331	−332
4	47274	357	50555	− 72	4	47940	294	51692	−241
11.45	47255	360	49561	58	11.95	47465	362	50819	−116
6	47587	316	48624	181	6	47344	380	49832	25
7	48229	232	47864	281	7	47593	345	48870	163
8	49097	118	47378	346	8	48178	261	48066	278
9	50081	− 12	47231	365	9	49018	141	47534	354
11.50	51053	−140	47440	338	12.00	49994	0	47347	382

u	C(u)	δ^2*	S(u)	δ^2*	u	C(u)	δ^2*	S(u)	δ^2*
	0.		0.			0.		0.	
12.00	49994	0	47347	382	12.50	50970	−152	47645	368
1	50971	−141	47534	356	1	51796	−282	48197	282
2	51810	−262	48067	279	2	52347	−369	49024	153
3	52393	−347	48872	163	3	52540	−400	49998	− 1
4	52639	−383	49835	23	4	52345	−369	50973	−154
12.05	52511	−365	50821	−120	12.55	51790	−282	51797	−284
6	52028	−295	51689	−247	6	50961	−151	52345	−371
7	51258	−183	52318	−338	7	49986	3	52532	−401
8	50310	− 44	52617	−382	8	49013	157	52330	−369
9	49318	100	52543	−372	9	48193	287	51768	−280
12.10	48425	231	52107	−308	12.60	47653	374	50935	−148
1	47757	330	51371	−201	1	47476	402	49957	8
2	47411	381	50439	− 64	2	47690	368	48987	162
3	47435	378	49446	82	3	48262	277	48175	292
4	47827	320	48532	217	4	49104	143	47647	377
12.15	48531	216	47831	321	12.65	50084	− 14	47485	403
6	49446	81	47442	379	6	51050	−169	47716	367
7	50440	− 66	47422	382	7	51852	−298	48302	273
8	51369	−204	47774	330	8	52363	−381	49154	136
9	52100	−313	48448	230	9	52505	−404	50137	− 23
12.20	52526	−376	49346	97	12.70	52253	−364	51098	−178
1	52585	−386	50338	− 51	1	51648	−266	51886	−306
2	52269	−339	51280	−192	2	50784	−126	52376	−386
3	51622	−242	52035	−305	3	49797	34	52492	−405
4	50740	−110	52493	−374	4	48844	189	52215	−360
12.25	49751	38	52586	−388	12.75	48073	314	51588	−258
6	48799	181	52302	−346	6	47609	390	50710	−115
7	48023	298	51680	−253	7	47523	405	49720	46
8	47539	372	50812	−122	8	47831	355	48776	201
9	47416	391	49826	27	9	48484	248	48027	324
12.30	47674	352	48866	172	12.80	49377	102	47593	396
1	48274	261	48075	293	1	50369	− 61	47543	404
2	49129	132	47568	370	2	51301	−215	47885	348
3	50112	− 18	47421	392	3	52025	−334	48566	236
4	51077	−165	47656	357	4	52423	−401	49476	86
12.35	51882	−288	48239	268	12.85	52432	−402	50469	− 78
6	52407	−368	49083	140	6	52051	−340	51386	−230
7	52572	−394	50063	− 10	7	51339	−222	52079	−346
8	52355	−361	51033	−159	8	50413	− 68	52437	−405
9	51786	−274	51847	−285	9	49420	97	52400	−400
12.40	50950	−146	52385	−367	12.90	48522	247	51976	−329
1	49973	5	52565	−396	1	47864	357	51232	−205
2	49000	155	52360	−364	2	47553	410	50289	− 48
3	48179	282	51801	−278	3	47640	395	49300	118
4	47633	367	50971	−150	4	48111	317	48425	265
12.45	47443	397	49995	2	12.95	48889	186	47808	369
6	47640	367	49021	153	6	49847	25	47549	413
7	48194	281	48196	281	7	50830	−141	47691	389
8	49021	152	47645	368	8	51676	−285	48210	301
9	49995	0	47452	398	9	52247	−381	49023	165
12.50	50970	−152	47645	368	13.00	52449	−415	49995	0

u	C(u)	δ^2*	S(u)	δ^2*	u	C(u)	δ^2*	S(u)	δ^2*
	0.		0.			0.		0.	
13.00	52449	−415	49995	0	13.50	49102	165	52180	−399
1	52247	−381	50968	−165	1	48285	315	51616	−296
2	51676	−284	51780	−303	2	47773	409	50765	−140
3	50829	−140	52298	−392	3	47658	430	49779	41
4	49845	27	52436	−415	4	47959	375	48834	215
13.05	48888	191	52171	−370	13.55	48623	253	48096	351
6	48116	323	51546	−264	6	49533	86	47700	425
7	47657	402	50666	−113	7	50525	− 98	47714	423
8	47588	414	49675	56	8	51423	−264	48137	344
9	47921	357	48740	217	9	52065	−383	48894	204
13.10	48599	241	48015	342	13.60	52336	−434	49849	27
1	49511	84	47622	410	1	52186	−406	50830	−155
2	50504	− 88	47627	410	2	51644	−306	51661	−310
3	51412	−245	48029	340	3	50806	−150	52192	−409
4	52082	−361	48762	214	4	49822	34	52327	−435
13.15	52402	−417	49702	51	13.65	48872	212	52041	−382
6	52318	−402	50691	−121	6	48127	351	51386	−259
7	51843	−320	51563	−273	7	47722	428	50480	− 89
8	51058	−184	52171	−379	8	47730	426	49488	97
9	50095	− 16	52411	−421	9	48152	347	48589	266
13.20	49116	155	52244	−392	13.70	48909	205	47948	387
1	48288	300	51696	−296	1	49865	25	47682	438
2	47751	395	50861	−150	2	50845	−160	47839	408
3	47597	422	49880	22	3	51669	−317	48391	304
4	47852	377	48921	191	4	52188	−415	49238	144
13.25	48473	268	48146	327	13.75	52304	−438	50223	− 43
6	49354	113	47688	408	6	51998	−380	51167	−223
7	50345	− 62	47626	419	7	51324	−252	51895	−361
8	51276	−226	47971	359	8	50407	− 77	52274	−434
9	51987	−353	48663	236	9	49415	112	52233	−426
13.30	52357	−419	49584	73	13.80	48533	281	51780	−340
1	52321	−412	50576	−103	1	47922	398	50998	−191
2	51885	−335	51468	−262	2	47697	442	50031	− 5
3	51125	−200	52106	−376	3	47899	403	49060	181
4	50171	− 30	52380	−425	4	48491	290	48264	335
13.35	49188	146	52242	−401	13.85	49364	122	47792	426
6	48346	297	51715	−307	6	50354	− 69	47731	438
7	47792	396	50891	−159	7	51278	−248	48094	368
8	47623	427	49913	16	8	51962	−380	48812	229
9	47867	384	48951	189	9	52278	−442	49752	47
13.40	48483	273	48172	330	13.90	52168	−421	50738	−144
1	49363	114	47713	413	1	51651	−320	51585	−309
2	50354	− 65	47655	424	2	50824	−160	52133	−416
3	51282	−232	48006	361	3	49843	31	52280	−445
4	51985	−360	48707	234	4	48892	217	51997	−390
13.45	52338	−425	49635	66	13.95	48151	362	51337	−261
6	52281	−416	50626	−114	6	47760	439	50425	− 83
7	51821	−331	51506	−275	7	47793	433	49434	112
8	51041	−189	52119	−387	8	48244	344	48550	285
9	50078	− 14	52358	−431	9	49028	191	47943	405
13.50	49102	165	52180	−399	14.00	49996	0	47726	448

u	$C(u)$	δ^{2*}	$S(u)$	δ^{2*}	u	$C(u)$	δ^{2*}	$S(u)$	δ^{2*}
	0.		0.			0.		0.	
14.00	49996	0	47726	448	14.50	49163	178	52029	−429
1	50964	−191	47943	406	1	48356	349	51453	−307
2	51748	−346	48551	286	2	47886	449	50580	−122
3	52197	−435	49435	111	3	47848	457	49590	88
4	52227	−441	50427	− 85	4	48251	372	48684	281
14.05	51830	−363	51336	−266	14.55	49012	210	48048	416
6	51083	−215	51988	−395	6	49975	5	47814	466
7	50128	− 25	52259	−450	7	50942	−202	48029	421
8	49150	170	52095	−417	8	51715	−368	48650	288
9	48336	333	51528	−305	9	52134	−457	49548	96
14.10	47843	431	50667	−133	14.60	52113	−453	50539	−116
1	47767	447	49678	65	1	51654	−355	51418	−305
2	48122	376	48752	251	2	50854	−183	52003	−431
3	48841	232	48068	388	3	49877	27	52172	−468
4	49783	43	47759	451	4	48927	232	51891	−408
14.15	50767	−155	47885	426	14.65	48200	389	51217	−262
6	51601	−323	48422	318	6	47848	466	50290	− 62
7	52123	−429	49265	148	7	47945	445	49304	151
8	52231	−451	50251	− 51	8	48470	331	48463	334
9	51903	−385	51187	−241	9	49315	148	47944	447
14.20	51204	−244	51891	−384	14.70	50302	− 66	47856	466
1	50270	− 54	52224	−452	1	51225	−267	48216	388
2	49284	146	52121	−431	2	51891	−413	48951	228
3	48439	319	51602	−326	3	52159	−472	49905	20
4	47901	428	50768	−156	4	51973	−431	50878	−193
14.25	47777	454	49785	45	14.75	51371	−300	51666	−365
6	48091	390	48844	237	6	50481	−105	52102	−461
7	48781	249	48132	383	7	49490	113	52094	−460
8	49712	58	47790	453	8	48608	309	51643	−361
9	50699	−144	47885	434	9	48021	436	50845	−186
14.30	51547	−319	48399	329	14.80	47853	474	49868	30
1	52087	−430	49230	158	1	48142	410	48920	239
2	52212	−456	50214	− 45	2	48825	259	48202	398
3	51898	−392	51154	−239	3	49758	53	47867	473
4	51205	−249	51864	−386	4	50741	−165	47987	446
14.35	50273	− 56	52201	−456	14.85	51566	−348	48537	325
6	49287	149	52099	−435	6	52056	−457	49398	133
7	48444	324	51576	−327	7	52105	−469	50388	− 87
8	47913	434	50739	−153	8	51704	−380	51294	−289
9	47802	458	49753	52	9	50937	−209	51921	−429
14.40	48132	389	48818	247	14.90	49970	7	52136	−478
1	48837	242	48122	393	1	49009	222	51891	−423
2	49776	46	47804	460	2	48263	390	51239	−277
3	50760	−160	47929	434	3	47892	473	50320	− 71
4	51589	−334	48473	320	4	47977	455	49333	151
14.45	52097	−441	49324	141	14.95	48498	338	48491	340
6	52179	−458	50312	− 66	6	49345	147	47976	457
7	51820	−383	51236	−261	7	50333	− 76	47900	474
8	51091	−230	51909	−403	8	51248	−283	48280	389
9	50141	− 29	52192	−463	9	51891	−428	49034	218
14.50	49163	178	52029	−429	15.00	52122	−481	49997	0

u	C(u)	δ^2*	S(u)	δ^2*	u	C(u)	δ^2*	S(u)	δ^2*
	0.		0.			0.		0.	
15.00	52122	−481	49997	0	15.50	50783	−190	48102	460
1	51891	−429	50960	−219	1	51580	−384	48690	318
2	51247	−283	51714	−390	2	52008	−488	49583	101
3	50331	− 75	52092	−476	3	51968	−479	50572	−140
4	49344	150	52012	−458	4	51469	−358	51427	−348
15.05	48501	343	51492	−340	15.55	50627	−153	51948	−476
6	47987	460	50645	−147	6	49640	89	52014	−492
7	47916	477	49656	79	7	48737	310	51607	−393
8	48303	389	48745	288	8	48131	458	50824	−201
9	49064	214	48110	434	9	47964	499	49849	38
15.10	50030	− 8	47892	484	15.60	48276	423	48909	269
1	50989	−228	48140	428	1	48993	247	48227	436
2	51729	−399	48799	276	2	49947	12	47963	502
3	52086	−481	49723	63	3	50913	−226	48180	449
4	51980	−457	50708	−164	4	51663	−411	48827	289
15.15	51434	−331	51535	−356	15.65	52019	−499	49750	61
6	50571	−132	52021	−468	6	51896	−469	50733	−182
7	49581	98	52056	−477	7	51324	−328	51541	−382
8	48685	306	51633	−379	8	50438	−108	51982	−492
9	48083	446	50847	−196	9	49448	138	51952	−485
15.20	47910	487	49871	31	15.70	48591	351	51458	−362
1	48204	419	48926	251	1	48070	481	50616	−153
2	48900	256	48221	416	2	48010	496	49628	93
3	49843	36	47916	487	3	48425	393	48730	318
4	50820	−193	48079	450	4	49217	195	48136	467
15.25	51612	−378	48674	311	15.75	50196	− 50	47988	504
6	52040	−479	49567	101	6	51127	−283	48324	420
7	52009	−472	50556	−131	7	51787	−449	49061	235
8	51524	−358	51420	−335	8	52017	−507	50024	− 7
9	50695	−163	51962	−463	9	51761	−443	50980	−247
15.30	49710	69	52060	−486	15.80	51082	−272	51700	−429
1	48791	286	51691	−399	1	50141	− 35	52008	−507
2	48146	439	50939	−222	2	49167	211	51832	−463
3	47924	492	49974	7	3	48396	406	51212	−306
4	48173	431	49015	234	4	48013	504	50299	− 75
15.35	48839	275	48282	409	15.85	48112	479	49315	174
6	49769	54	47941	490	6	48670	337	48497	382
7	50750	−179	48070	460	7	49550	114	48045	497
8	51560	−373	48640	324	8	50540	−138	48070	492
9	52012	−481	49521	114	9	51397	−357	48564	366
15.40	52003	−479	50511	−123	15.90	51913	−489	49409	150
1	51534	−367	51384	−332	1	51961	−501	50397	−102
2	50713	−170	51937	−465	2	51529	−391	51288	−330
3	49728	66	52045	−491	3	50724	−185	51863	−478
4	48807	287	51682	−404	4	49741	67	51980	−508
15.45	48162	443	50931	−224	15.95	48823	303	51611	−414
6	47941	496	49965	9	6	48194	465	50847	−217
7	48197	435	49009	240	7	48011	513	49875	33
8	48870	273	48282	416	8	48318	434	48934	276
9	49804	47	47954	495	9	49039	248	48257	451
15.50	50783	−190	48102	460	16.00	49998	0	48011	515

u	C(u)	δ^{2*}	S(u)	δ^{2*}	u	C(u)	δ^{2*}	S(u)	δ^{2*}
	0.		0.			0.		0.	
16.00	49998	0	48011	515	16.50	50736	−203	48217	491
1	50956	−248	48257	451	1	51522	−420	48817	326
2	51677	−435	48934	276	2	51907	−527	49727	75
3	51982	−515	49876	32	3	51790	−495	50709	−197
4	51795	−466	50847	−221	4	51201	−332	51504	−417
16.05	51161	−302	51608	−419	16.55	50296	− 81	51900	−527
6	50240	− 62	51967	−513	6	49312	191	51795	−498
7	49259	194	51837	−479	7	48512	414	51215	−337
8	48464	402	51248	−326	8	48106	527	50313	− 87
9	48053	510	50348	− 91	9	48202	500	49329	187
16.10	48129	490	49362	168	16.60	48776	341	48524	412
1	48673	348	48536	384	1	49675	90	48111	527
2	49550	118	48077	505	2	50659	−185	48202	502
3	50539	−142	48102	499	3	51467	−411	48771	344
4	51392	−367	48603	367	4	51884	−528	49668	93
16.15	51894	−500	49455	143	16.65	51797	−504	50653	−184
6	51919	−506	50444	−118	6	51230	−345	51462	−411
7	51460	−385	51321	−349	7	50334	− 93	51880	−529
8	50632	−167	51863	−493	8	49349	184	51794	−505
9	49646	94	51934	−512	9	48539	412	51226	−345
16.20	48749	332	51515	−402	16.70	48123	530	50330	− 93
1	48170	486	50713	−189	1	48211	505	49345	186
2	48056	517	49731	72	2	48781	344	48538	414
3	48436	416	48817	315	3	49679	90	48125	531
4	49213	209	48205	479	4	50663	−189	48218	505
16.25	50190	− 51	48050	520	16.75	51468	−417	48793	342
6	51118	−299	48393	429	6	51874	−533	49694	87
7	51760	−471	49145	228	7	51773	−505	50677	−193
8	51952	−523	50116	− 32	8	51191	−339	51476	−421
9	51644	−441	51056	−284	9	50287	− 81	51874	−535
16.30	50916	−246	51725	−464	16.80	49305	199	51762	−503
1	49953	13	51951	−525	1	48512	426	51171	−335
2	49003	269	51676	−451	2	48126	537	50262	− 74
3	48310	456	50971	−261	3	48251	502	49281	207
4	48052	526	50016	− 4	4	48853	329	48498	432
16.35	48297	460	49057	255	16.85	49768	66	48125	539
6	48980	275	48343	449	6	50747	−216	48266	499
7	49927	19	48057	527	7	51520	−438	48882	322
8	50892	−243	48274	468	8	51875	−541	49804	56
9	51625	−442	48937	288	9	51716	−496	50779	−226
16.40	51937	−527	49876	33	16.90	51085	−313	51540	−446
1	51745	−475	50846	−231	1	50155	− 44	51876	−543
2	51101	−300	51596	−436	2	49184	237	51695	−491
3	50170	− 46	51930	−527	3	48438	454	51047	−303
4	49195	221	51761	−481	4	48124	545	50109	− 31
16.45	48431	430	51133	−310	16.95	48329	486	49143	250
6	48078	527	50210	− 57	6	48997	292	48414	462
7	48226	486	49232	211	7	49942	16	48125	547
8	48839	318	48456	425	8	50902	−264	48357	480
9	49756	67	48085	527	9	51612	−472	49045	279
16.50	50736	−203	48217	491	17.00	51872	−548	49998	0

u	C(u)	δ^2*	S(u)	δ^2*	u	C(u)	δ^2*	S(u)	δ^2*
	0.		0.			0.		0.	
17.00	51872	−548	49998	0	17.50	49306	216	51681	−522
1	51612	−472	50951	−279	1	48530	458	51070	−332
2	50902	−264	51638	−481	2	48189	564	50143	− 44
3	49941	18	51868	−549	3	48382	504	49175	258
4	48997	296	51576	−463	4	49054	295	48451	484
17.05	48334	491	50843	−248	17.55	50005	− 2	48186	567
6	48138	549	49874	38	6	50954	−299	48459	482
7	48465	453	48942	313	7	51620	−508	49188	254
8	49222	230	48307	501	8	51804	−566	50158	− 50
9	50197	− 59	48148	548	9	51451	−455	51081	−340
17.10	51116	−331	48510	441	17.60	50668	−209	51681	−529
1	51720	−511	49292	210	1	49685	100	51780	−560
2	51839	−546	50273	− 82	2	48797	379	51348	−424
3	51439	−428	51176	−350	3	48269	546	50514	−162
4	50632	−188	51746	−520	4	48259	550	49527	150
17.15	49647	106	51822	−543	17.65	48769	389	48682	417
6	48763	370	51382	−412	6	49648	111	48232	560
7	48230	529	50550	−164	7	50632	−201	48313	534
8	48200	538	49563	131	8	51426	−453	48900	348
9	48681	395	48700	390	9	51790	−569	49818	57
17.20	49538	138	48208	538	17.70	51616	−514	50790	−252
1	50526	−158	48227	532	1	50955	−304	51523	−485
2	51363	−410	48751	375	2	50006	− 1	51796	−573
3	51810	−545	49632	110	3	49057	302	51527	−487
4	51740	−524	50617	−186	4	48392	514	50797	−254
17.25	51172	−353	51425	−430	17.75	48215	571	49826	56
6	50269	− 81	51825	−551	6	48579	455	48908	350
7	49289	216	51700	−514	7	49373	201	48322	538
8	48514	450	51088	−329	8	50357	−115	48246	563
9	48166	556	50163	− 49	9	51232	−396	48702	417
17.30	48347	501	49192	246	17.80	51732	−557	49554	143
1	49004	302	48455	470	1	51704	−549	50540	−174
2	49947	15	48163	559	2	51156	−372	51361	−439
3	50906	−276	48402	486	3	50256	− 82	51767	−570
4	51602	−489	49103	273	4	49279	234	51632	−527
17.35	51834	−560	50063	− 20	17.85	48522	479	50998	−322
6	51534	−469	51004	−307	6	48219	577	50059	− 19
7	50790	−241	51653	−506	7	48462	499	49102	292
8	49817	57	51822	−558	8	49176	267	48422	513
9	48898	339	51461	−448	9	50144	− 47	48227	576
17.40	48300	522	50675	−207	17.90	51066	−347	48577	463
1	48198	554	49693	95	1	51660	−541	49365	206
2	48621	424	48801	370	2	51742	−568	50349	−114
3	49447	170	48259	537	3	51286	−420	51224	−400
4	50434	−135	48227	547	4	50433	−141	51721	−563
17.45	51294	−400	48714	397	17.95	49447	182	51685	−551
6	51773	−549	49577	130	6	48633	448	51128	−369
7	51733	−536	50564	−175	7	48243	577	50221	− 72
8	51183	−366	51384	−429	8	48398	526	49247	248
9	50286	− 88	51797	−558	9	49051	312	48507	491
17.50	49306	216	51681	−522	18.00	49998	0	48232	582

u	$C(u)$	δ^{2*}	$S(u)$	δ^{2*}	u	$C(u)$	δ^{2*}	$S(u)$	δ^{2*}
	0.		0.			0.		0.	
18.00	49998	0	48232	582	18.50	49343	229	51590	−554
1	50946	−312	48507	492	1	48578	496	50968	−337
2	51598	−527	49247	248	2	48281	600	50028	− 9
3	51751	−578	50222	− 74	3	48550	506	49079	322
4	51358	−449	51127	−373	4	49296	246	48434	548
18.05	50540	−178	51679	−556	18.55	50274	− 96	48306	593
6	49554	148	51705	−565	6	51160	−407	48737	442
7	48708	429	51197	−397	7	51663	−584	49585	145
8	48268	576	50314	−104	8	51616	−567	50570	−201
9	48372	541	49333	222	9	51033	−363	51365	−480
18.10	48987	337	48562	479	18.60	50109	− 38	51708	−601
1	49921	26	48244	585	1	49149	300	51484	−523
2	50879	−294	48479	507	2	48472	539	50767	−270
3	51560	−521	49194	269	3	48304	599	49796	73
4	51747	−584	50162	− 55	4	48700	460	48893	392
18.15	51383	−463	51079	−362	18.65	49529	166	48360	581
6	50581	−194	51654	−555	6	50514	−183	48374	576
7	49596	136	51705	−572	7	51328	−471	48930	379
8	48739	424	51215	−408	8	51697	−603	49844	55
9	48283	577	50340	−114	9	51498	−533	50810	−288
18.20	48373	548	49358	217	18.70	50798	−284	51504	−536
1	48980	343	48580	479	1	49831	61	51693	−603
2	49912	29	48255	589	2	48921	386	51314	−468
3	50871	−295	48486	511	3	48374	581	50494	−176
4	51551	−525	49200	270	4	48374	581	49508	176
18.25	51736	−588	50169	− 58	18.75	48922	386	48689	470
6	51366	−463	51083	−368	6	49832	60	48312	605
7	50558	−189	51650	−560	7	50799	−287	48504	536
8	49573	146	51688	−573	8	51495	−537	49202	286
9	48725	434	51184	−403	9	51686	−606	50169	− 61
18.30	48287	584	50301	−102	18.80	51306	−470	51078	−388
1	48400	545	49321	232	1	50484	−174	51622	−584
2	49027	332	48560	492	2	49498	182	51615	−582
3	49968	10	48264	593	3	48684	476	51060	−383
4	50918	−315	48527	503	4	48317	609	50146	− 52
18.35	51572	−538	49266	251	18.85	48523	534	49182	296
6	51717	−589	50242	− 83	6	49231	278	48497	545
7	51306	−448	51138	−391	7	50202	− 74	48325	607
8	50473	−162	51666	−573	8	51103	−401	48725	463
9	49487	177	51653	−569	9	51626	−591	49559	160
18.40	48668	459	51104	−380	18.90	51594	−580	50544	−198
1	48282	592	50196	− 67	1	51016	−370	51342	−489
2	48455	533	49226	268	2	50090	− 32	51680	−613
3	49131	300	48507	516	3	49134	317	51441	−526
4	50089	− 31	48276	596	4	48476	557	50708	−258
18.45	51018	−353	48607	482	18.95	48342	607	49732	98
6	51614	−560	49393	210	6	48778	447	48849	422
7	51682	−584	50377	−131	7	49635	133	48362	601
8	51199	−416	51237	−430	8	50617	−227	48441	572
9	50324	−112	51691	−588	9	51386	−509	49057	346
18.50	49343	229	51590	−554	19.00	51675	−616	49999	0

u	C(u)	δ^{2*}	S(u)	δ^{2*}	u	C(u)	δ^{2*}	S(u)	δ^{2*}
	0.		0.			0.		0.	
19.00	51675	−616	49999	0	19.50	50623	−242	48491	585
1	51386	−510	50940	−347	1	51377	−535	49125	340
2	50616	−227	51556	−574	2	51629	−633	50076	− 30
3	49634	135	51632	−602	3	51287	−501	51000	−390
4	48779	451	51142	−422	4	50476	−185	51558	−607
19.05	48349	611	50256	− 94	19.55	49492	199	51547	−603
6	48492	558	49282	266	6	48694	510	50971	−379
7	49160	311	48558	535	7	48374	636	50040	− 15
8	50120	− 45	48336	617	8	48650	528	49095	355
9	51038	−386	48695	485	9	49420	227	48482	595
19.10	51592	−592	49509	182	19.60	50403	−158	48427	617
1	51591	−592	50494	−184	1	51237	−486	48949	412
2	51033	−385	51306	−487	2	51616	−635	49857	56
3	50114	− 42	51660	−619	3	51400	−551	50817	−322
4	49156	316	51433	−535	4	50669	−263	51476	−582
19.15	48494	563	50703	−262	19.65	49692	122	51590	−627
6	48361	613	49727	103	6	48828	463	51117	−441
7	48805	448	48848	432	7	48398	633	50232	− 91
8	49668	124	48374	610	8	48561	569	49261	292
9	50648	−244	48473	573	9	49256	294	48565	568
19.20	51399	−526	49110	334	19.70	50226	− 90	48400	634
1	51656	−623	50061	− 24	1	51112	−442	48829	464
2	51328	−500	50990	−373	2	51585	−629	49692	122
3	50530	−200	51568	−591	3	51468	−583	50669	−267
4	49546	172	51591	−600	4	50805	−320	51397	−556
19.25	48723	483	51050	−396	19.75	49843	63	51604	−639
6	48353	623	50137	− 51	6	48940	423	51213	−483
7	48568	542	49176	312	7	48433	626	50370	−147
8	49292	268	48509	566	8	48511	595	49389	245
9	50267	−102	48372	618	9	49146	341	48637	545
19.30	51147	−436	48815	450	19.80	50100	− 40	48395	642
1	51617	−615	49680	121	1	51016	−407	48755	499
2	51510	−575	50659	−251	2	51550	−622	49581	168
3	50864	−329	51402	−535	3	51503	−604	50564	−227
4	49909	35	51643	−627	4	50891	−358	51334	−537
19.35	48988	387	51297	−495	19.85	49945	23	51603	−645
6	48429	601	50486	−185	6	49019	395	51268	−511
7	48434	599	49501	191	7	48464	620	50456	−183
8	49001	382	48696	500	8	48488	610	49472	214
9	49927	28	48360	629	9	49083	370	48688	530
19.40	50878	−338	48614	532	19.90	50024	− 10	48401	647
1	51513	−582	49367	243	1	50955	−387	48718	519
2	51602	−616	50347	−134	2	51524	−618	49520	194
3	51113	−428	51202	−463	3	51516	−615	50504	−205
4	50223	− 85	51622	−626	4	50932	−378	51296	−527
19.45	49253	289	51456	−562	19.95	49995	3	51596	−649
6	48553	559	50763	−294	6	49060	383	51289	−524
7	48378	627	49794	80	7	48484	618	50492	−200
8	48791	468	48901	426	8	48485	618	49508	201
9	49643	138	48406	618	9	49063	382	48712	526
19.50	50623	−242	48491	585	20.00	49999	0	48408	651