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The Reliability of USU Telemetered Precipitation Data: 1. The Counter Precision Factor for 8 inch by 36 inch Gages

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THE RELIABILITY OF USU TELEMETERED

PRECIPITATION DATA--1

The Counter Precision Factor for 8" x 36" Gages

by

George W. Reynolds and Duane G. Chadwick

Utah Water Research Laboratory

Utah State University

Logan, Utah

Technical Report No. 3

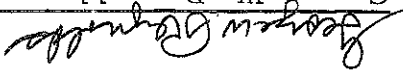
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George W. Reynolds

Project Leader

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PRECIPITATION DATA--1

The Counter Precision Factor for 8" x 36" Gages

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Abstract

The telemetered precipitation data are read out as frequency or period numbers by an electronic counter. These counts are to be converted to inches of precipitation. The readout electronic count is within 1 count of the transmitted count.

This study applies only to the 8" x 36" cans.

Using the frequency count readout gives a precision of $\pm .02$ " to $\pm .05$ " of water equivalence and varies between .02" and .04" when there is between 10" and 30" of water equivalence in the can. Period counts give more precise measurements, ranging between $\pm .01$ " and $\pm .03$ " of precipitation over the whole scale. It is only $\pm .01$ " when there is between 15" and 35" of water equivalence in the can.

The study also provides an interim set of tables for converting frequency and period counts to precipitation amounts.

THE RELIABILITY OF USU TELEMETERED

PRECIPITATION DATA -- 1

The Counter Precision Factor for 8" x 36" Gages

George W. Reynolds and Duane G. Chadwick

The purpose of this study was to determine the precision limitations imposed on the precipitation data, from 8" x 36" gages, by the operational characteristics of the electronic counter in the terminal readout equipment. This work was also to produce tables for manually converting electromagnetic frequencies and periods to their equivalent precipitation amounts.

Introduction

The Utah Water Research Laboratory plan for the evaluation of cloud seeding activities is built around an expected dense network of can-type precipitation gages, supplemented by snow pillow and other meteorological measurement systems. Each of these precipitation gages will report, through a relay system, to the terminal readout station at Utah State University.

The seeding is to be from ground based generators. Eventually there is to be a generator on Willard Mountain, another near Bountiful Peak, and two in the Salt Lake Valley immediately to the west, one

below each mountain top generator. Seeding during the 1967-68 winter will probably be from the Willard Mountain generator only, but additional seeding from one of the other generators later in the season is a possibility. The statistical design calls for point rather than line seeding, and for evaluation by comparison between the observed precipitation amounts in assumed target and control areas. The differences in storm precipitation characteristics between seeded and unseeded storms, for each of selected stations, will also be used as a basis for estimating the effectiveness of cloud seeding activities.

For the "target versus control" technique, the basic data will be the observed differences in the areally averaged amounts of precipitation received at target and control stations. These areal averages will be calculated in the normal manner, separately for each storm, from actually measured precipitation amounts. However, there are several factors which contribute to each measured difference:

a. Natural differences. These may be either

(1) Topographical (ΔP^t), or

(2) Meteorological (ΔP^m)

b. Instrumentation errors (ΔP^I)

c. Exposure errors (ΔP^E)

d. The precision factor, whether the results of manual

or mechanical rounding (ΔP^p)

At first glance it would seem that several of these contributors would be eliminated by applying the seeded versus unseeded storm technique. However, the topographical effect (ΔP^t) at a station will vary with flow patterns, and there is a natural variation in precipitation amounts from storm to storm (ΔP^m), even with synoptic stratification. Instrument errors (ΔP^I) may vary with temperature and wind conditions, and exposure effects (ΔP^E) are dependent upon wind speed. Chance

$$\Delta P^s = \Delta P^t - \Delta P^m - \Delta P^I - \Delta P^E - \Delta P^p - \Delta P^{TC} - \Delta P^{co} - \Delta P^{os} - \Delta P^{AP}$$

or

$$\Delta P = \Delta P^t + \Delta P^m + \Delta P^I + \Delta P^E + \Delta P^p + \Delta P^{TC} + \Delta P^{co} + \Delta P^{os} + \Delta P^{AP} + \Delta P^s$$

That is, if ΔP is the calculated areal average difference, then

- i. Possible seeding effects (ΔP^s)
- h. Possible effects of inadvertent seeding by air pollution and California (ΔP^{os})
- g. Possible effects from current seeding activities in Nevada
- f. Possible carry-over effects from previous seedings (ΔP^{co}) area (ΔP^{TC}).
- e. Errors from mistakenly including unseeded stations within the "target" area and seeded stations within the "control"

The telemetered data, precipitation and otherwise, are received at the terminal readout station as an audiotone which can be characterized

The Counter Precision Effect

This study reports the estimated magnitudes of one of the random contributors to the precision factor (ΔP^p) for precipitation data. We have an idea of the relative approximate size of the random variable. subjective estimate of the required sample size, it is necessary to are enough elements in the sample. However, in arriving at even a For the random factors, the delta effect is averaged out, if there other delta factors.

noted that in at least some cases ΔP^s is not large with regard to the quantity the effects of a specific seeding activity (ΔP^s). It should be statistically or experimentally defined, in order to Obviously, these other difference factors must either be controlled,

$$\Delta P^s = \Delta P - \Delta P^t - \Delta P^m - \Delta P^I - \Delta P^E - \Delta P^p - \Delta P^{su} - \Delta P^{co} - \Delta P^{os} - \Delta P^{AP}$$

seeded storm technique. Again, pollution (ΔP^{AP}) remain as possibilities with the seeded versus un- Variable effects of carry-over (ΔP^{co}), other seeding (ΔP^{os}), and air a seeded volume when it actually did not, and vice versa (ΔP^{su}). sometimes we may believe that the precipitation at a station came from rounding effects (ΔP^p) will be different from storm to storm, and

by either a frequency or a period number. By the UWRL system, this number is obtained by an electronic counter, which is randomly within one count of the correct count. For precipitation, each count corresponds to the total weight on the transducer under the precipitation can. Since the 8" x 36" can is a uniform cylinder, this weight, in turn, corresponds in a regular and predictable way to the inches of water equivalence in the can.

Count-depth relationships were established for selected depths, for the 8" x 36" can, at room temperature, with the temperature in the vicinity of 70°F. Then using the Lagrange interpolation formula (1), a program for the calculation of the frequencies and periods corresponding to precipitation amounts up to 35.88 inches of water* was written.

These calculations apply to the transducers which are in use with the small (8" x 36") precipitation gages. This gage is suitable only for those stations receiving relatively small amounts of precipitation. For stations receiving considerable snow, the standard large can used by the Soil Conservation Service (SCS) will be employed, and new count-depth relationships must be calculated. However, the small gage is adequate for field testing, as well as for operational use, at most stations with elevations at or below 5500 feet MSL.

The Honeywell 1200 printout, showing both the frequency count-

*For wintertime precipitation, we are usually interested only in indicated amounts of about 10" or more, since the cans are charged with antifreeze.

alone, ignoring all other factors, a frequency count of 1460, for example, indicates that the water equivalence is between 29.96 inches and 30.04 inches. The period count-depth relationship gives more precise limitations of precipitation amounts.

Table 2.

Period x 10 ⁷ sec	4044	4045	4252	4253	4515	4516	5010
Inches of water	.03	.06	5.00	5.03	10.01	10.03	15.00
Period x 10 ⁷ sec	5011	5599	5600	6849	6850	7429	7430
Inches of water	15.01	20.00	20.01	30.00	30.01	35.00	35.01

In a large portion of the precipitation spectrum, a change of 1 in the period count corresponds to a change in water equivalence of .01 inch. Again, considering only the counter instability factor, a period count of 6850, for example, indicates that the water equivalence is between 30.00 inches and 30.02 inches.

Operational Tables

In addition to providing desirable information concerning the precision limits imposed by the counter, these tables serve an interim operational function as well. The plan calls for a digital computer program which will convert these electromagnetic values into engineering units (i.e. inches, degrees, etc.) simultaneously with the processing

and analytical operations. Further, the specific relationships reported by these tables, will be changed somewhat with expected modifications of the transducer. Thus, new tables will eventually be necessary. However, during the developmental and installation phases, for both field and terminal equipment, manual conversion becomes the practicable procedure. This can be accomplished either by using these operational tables or by using nomograms based upon these tables. Considering the ranges of values involved, and reasonable precision for each estimated value, the required scale for a single nomogram would be prohibitive. It is also obvious that these tables are easier to use than the voluminous set of nomograms required to allow for a reasonable graphic scale.

Conclusion

Using the frequency count-depth technique, the precision of the resulting precipitation data ranges between $\pm .02$ and $\pm .05$ inch, and is between $\pm .02$ inch and $\pm .04$ inch for 10 to 30 inches of water equivalence in the can. Using the period count-depth technique, the range is from $\pm .01$ inch to $\pm .03$ inch, and is $\pm .01$ inch for between 15 and 35 inches of water equivalence. A tentative set of tables for converting frequency and period counts into precipitation values, for those stations using the 8" x 36" can, has also resulted from this study.

This investigation provides information concerning only one of

the many contributors to the values of reported precipitation and

differences in precipitation. Additional studies will be devoted to the

other "delta" factors.

References

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Appendix A

For each 3-line group:

- a. The top line gives the frequency.
- b. The middle line gives the number which is 10^7 times the period in seconds.
- c. The third line gives the equivalent inches of precipitation.

1258	4088	1998	4088	1998	4088	1998	4088
1259	4089	1999	4089	1999	4089	1999	4089
1260	4090	2000	4090	2000	4090	2000	4090
1261	4091	2001	4091	2001	4091	2001	4091
1262	4092	2002	4092	2002	4092	2002	4092
1263	4093	2003	4093	2003	4093	2003	4093
1264	4094	2004	4094	2004	4094	2004	4094
1265	4095	2005	4095	2005	4095	2005	4095
1266	4096	2006	4096	2006	4096	2006	4096
1267	4097	2007	4097	2007	4097	2007	4097
1268	4098	2008	4098	2008	4098	2008	4098
1269	4099	2009	4099	2009	4099	2009	4099
1270	4100	2010	4100	2010	4100	2010	4100
1271	4101	2011	4101	2011	4101	2011	4101
1272	4102	2012	4102	2012	4102	2012	4102
1273	4103	2013	4103	2013	4103	2013	4103
1274	4104	2014	4104	2014	4104	2014	4104
1275	4105	2015	4105	2015	4105	2015	4105
1276	4106	2016	4106	2016	4106	2016	4106
1277	4107	2017	4107	2017	4107	2017	4107
1278	4108	2018	4108	2018	4108	2018	4108
1279	4109	2019	4109	2019	4109	2019	4109
1280	4110	2020	4110	2020	4110	2020	4110
1281	4111	2021	4111	2021	4111	2021	4111
1282	4112	2022	4112	2022	4112	2022	4112
1283	4113	2023	4113	2023	4113	2023	4113
1284	4114	2024	4114	2024	4114	2024	4114
1285	4115	2025	4115	2025	4115	2025	4115
1286	4116	2026	4116	2026	4116	2026	4116
1287	4117	2027	4117	2027	4117	2027	4117
1288	4118	2028	4118	2028	4118	2028	4118
1289	4119	2029	4119	2029	4119	2029	4119
1290	4120	2030	4120	2030	4120	2030	4120

1270	7874	7872	7870	7869	7867	7866	7864	7863
39°57	39°55	39°54	39°52	39°50	39°48	39°48	39°46	39°45
1271	7861	7860	7858	7857	7855	7853	7852	7850
39°43	39°41	39°39	39°38	39°36	39°34	39°32	39°32	39°30
1272	7849	7847	7846	7844	7843	7841	7840	7838
39°29	39°27	39°25	39°23	39°21	39°20	39°18	39°18	39°16
1273	7836	7835	7833	7832	7830	7829	7827	7826
39°14	39°13	39°11	39°09	39°07	39°05	39°04	39°04	39°02
1274	7824	7823	7821	7820	7818	7817	7815	7814
39°00	38°98	38°96	38°94	38°92	38°91	38°89	38°89	38°87
1275	7812	7810	7809	7807	7806	7804	7803	7801
38°85	38°82	38°81	38°79	38°78	38°76	38°74	38°74	38°72
1276	7800	7798	7797	7795	7794	7792	7791	7789
38°70	38°68	38°67	38°65	38°63	38°61	38°59	38°59	38°58
1277	7788	7786	7785	7783	7782	7780	7779	7777
38°56	38°54	38°52	38°50	38°49	38°47	38°45	38°45	38°43
1278	7776	7774	7773	7771	7770	7768	7766	7765
38°41	38°40	38°38	38°36	38°34	38°33	38°31	38°31	38°29
1279	7763	7762	7760	7759	7757	7756	7754	7753
38°27	38°26	38°24	38°22	38°20	38°19	38°17	38°17	38°15
1280	7751	7750	7748	7747	7745	7744	7742	7741
38°14	38°12	38°10	38°08	38°07	38°05	38°03	38°03	38°02
1281	7739	7738	7736	7735	7733	7732	7730	7729
38°00	37°98	37°97	37°95	37°93	37°92	37°90	37°90	37°88
1282	7727	7726	7724	7723	7722	7720	7719	7717
37°87	37°85	37°83	37°82	37°80	37°78	37°77	37°77	37°75
1283	7716	7714	7713	7711	7710	7708	7707	7705
37°73	37°72	37°70	37°68	37°67	37°65	37°64	37°64	37°62
1284	7704	7702	7701	7699	7698	7696	7695	7693
37°60	37°59	37°57	37°56	37°54	37°52	37°51	37°51	37°49

1368	3300	3203	3202	3201	3200	3199	3198
1369	3309	3218	3217	3216	3215	3214	3213
1370	3319	3228	3227	3226	3225	3224	3223
1371	3328	3237	3236	3235	3234	3233	3232
1372	3338	3246	3245	3244	3243	3242	3241
1373	3347	3255	3254	3253	3252	3251	3250
1374	3357	3264	3263	3262	3261	3260	3259
1375	3366	3273	3272	3271	3270	3269	3268
1376	3376	3282	3281	3280	3279	3278	3277
1377	3385	3291	3290	3289	3288	3287	3286
1378	3395	3300	3299	3298	3297	3296	3295
1379	3405	3309	3308	3307	3306	3305	3304
1380	3415	3318	3317	3316	3315	3314	3313
1381	3424	3327	3326	3325	3324	3323	3322
1382	3434	3336	3335	3334	3333	3332	3331
1383	3443	3345	3344	3343	3342	3341	3340
1384	3453	3354	3353	3352	3351	3350	3349
1385	3462	3363	3362	3361	3360	3359	3358
1386	3472	3372	3371	3370	3369	3368	3367
1387	3481	3381	3380	3379	3378	3377	3376
1388	3491	3390	3389	3388	3387	3386	3385
1389	3500	3400	3399	3398	3397	3396	3395
1390	3510	3409	3408	3407	3406	3405	3404
1391	3519	3418	3417	3416	3415	3414	3413
1392	3529	3427	3426	3425	3424	3423	3422
1393	3538	3436	3435	3434	3433	3432	3431
1394	3548	3445	3444	3443	3442	3441	3440
1395	3557	3454	3453	3452	3451	3450	3449
1396	3567	3463	3462	3461	3460	3459	3458
1397	3576	3472	3471	3470	3469	3468	3467
1398	3586	3481	3480	3479	3478	3477	3476
1399	3595	3490	3489	3488	3487	3486	3485
1400	3605	3499	3498	3497	3496	3495	3494

1448	30°47'	6906	30°46'	6904	30°45'	6903	30°44'	6901	30°43'	6900	30°42'	6998	30°41'	6997	30°40'
1449	30°50'	6913	30°49'	6911	30°48'	6910	30°47'	6909	30°46'	6908	30°45'	6906	30°44'	6905	30°43'
1444	30°53'	6925	30°52'	6924	30°51'	6922	30°50'	6921	30°49'	6919	30°48'	6918	30°47'	6916	30°46'
1442	30°71'	6934	30°70'	6933	30°69'	6932	30°68'	6931	30°67'	6928	30°66'	6927	30°65'	6926	30°64'
1440	30°79'	6944	30°78'	6943	30°77'	6942	30°76'	6940	30°75'	6938	30°74'	6937	30°73'	6936	30°72'
1438	30°88'	6954	30°87'	6952	30°86'	6950	30°85'	6949	30°84'	6948	30°83'	6946	30°82'	6945	30°81'
1436	30°96'	6962	30°95'	6961	30°94'	6960	30°93'	6959	30°92'	6957	30°91'	6956	30°90'	6955	30°89'
1434	31°04'	6972	31°03'	6971	31°02'	6969	31°01'	6968	31°00'	6967	30°59'	6966	30°58'	6965	30°57'
1432	31°12'	6982	31°11'	6980	31°10'	6979	31°09'	6978	31°08'	6977	31°07'	6975	31°06'	6974	31°05'
1430	31°20'	6992	31°19'	6990	31°18'	6989	31°17'	6988	31°16'	6986	31°15'	6985	31°14'	6984	31°13'
1428	31°28'	7002	31°27'	7000	31°26'	6999	31°25'	6997	31°24'	6996	31°23'	6995	31°22'	6994	31°21'
1426	31°36'	7012	31°35'	7010	31°34'	7008	31°33'	7007	31°32'	7006	31°31'	7005	31°30'	7004	31°29'
1424	31°44'	7022	31°43'	7020	31°42'	7018	31°41'	7017	31°40'	7016	31°39'	7015	31°38'	7014	31°37'
1422	31°52'	7032	31°51'	7030	31°50'	7028	31°49'	7027	31°48'	7026	31°47'	7025	31°46'	7024	31°45'
1420	31°60'	7042	31°59'	7040	31°58'	7038	31°57'	7037	31°56'	7036	31°55'	7035	31°54'	7034	31°53'

1478	6765	29.33	6763	29.31	6762	29.30	6761	29.29	6760	29.28	6759	29.27	6757	29.25
1476	6775	29.40	6773	29.38	6771	29.37	6770	29.36	6769	29.35	6768	29.34	6767	29.34
1474	6784	29.47	6783	29.46	6781	29.45	6780	29.44	6779	29.43	6777	29.42	6776	29.41
1472	6793	29.55	6792	29.54	6791	29.53	6790	29.52	6788	29.51	6787	29.49	6786	29.48
1470	6802	29.62	6801	29.61	6800	29.60	6799	29.58	6798	29.58	6796	29.57	6795	29.56
1468	6811	29.70	6810	29.69	6809	29.68	6808	29.67	6807	29.66	6806	29.65	6805	29.63
1466	6821	29.77	6820	29.76	6818	29.75	6817	29.74	6816	29.73	6815	29.72	6814	29.71
1464	6830	29.85	6829	29.84	6828	29.83	6827	29.82	6825	29.81	6824	29.79	6823	29.78
1462	6839	29.92	6838	29.91	6837	29.90	6836	29.90	6835	29.89	6834	29.88	6833	29.86
1460	6849	30.00	6848	29.99	6846	29.98	6845	29.97	6844	29.96	6843	29.95	6842	29.94
1458	6858	30.08	6857	30.07	6856	30.06	6855	30.05	6854	30.04	6853	30.03	6851	30.01
1456	6868	30.16	6866	30.15	6865	30.14	6864	30.13	6863	30.12	6862	30.11	6861	30.09
1454	6877	30.23	6876	30.22	6875	30.21	6874	30.20	6872	30.19	6871	30.18	6870	30.16
1452	6887	30.31	6886	30.30	6884	30.29	6883	30.28	6882	30.27	6881	30.26	6879	30.24
1450	6896	30.39	6895	30.38	6894	30.37	6893	30.36	6891	30.35	6890	30.33	6888	30.32

1504	28728	6690	28716	6691	28704	6692	28692
1505	28739	6691	28727	6692	28715	6693	28703
1506	28750	6692	28738	6693	28726	6694	28714
1507	28761	6693	28749	6694	28737	6695	28725
1508	28772	6694	28760	6695	28748	6696	28736
1509	28783	6695	28771	6696	28759	6697	28747
1510	28794	6696	28782	6697	28770	6698	28758
1511	28805	6697	28793	6698	28781	6699	28769
1512	28816	6698	28804	6699	28792	6700	28780
1513	28827	6699	28815	6700	28803	6701	28791
1514	28838	6700	28826	6701	28814	6702	28802
1515	28849	6701	28837	6702	28825	6703	28813
1516	28860	6702	28848	6703	28836	6704	28824
1517	28871	6703	28859	6704	28847	6705	28835
1518	28882	6704	28870	6705	28858	6706	28846
1519	28893	6705	28881	6706	28869	6707	28857
1520	28904	6706	28892	6707	28880	6708	28868
1521	28915	6707	28903	6708	28891	6709	28879
1522	28926	6708	28914	6709	28902	6710	28890
1523	28937	6709	28925	6710	28913	6711	28901
1524	28948	6710	28936	6711	28924	6712	28912
1525	28959	6711	28947	6712	28935	6713	28923
1526	28970	6712	28958	6713	28946	6714	28934
1527	28981	6713	28969	6714	28957	6715	28945
1528	28992	6714	28980	6715	28968	6716	28956
1529	29003	6715	28991	6716	28979	6717	28967
1530	29014	6716	29002	6717	28990	6718	28978
1531	29025	6717	29013	6718	29001	6719	28989
1532	29036	6718	29024	6719	29012	6720	28990
1533	29047	6719	29035	6720	29023	6721	29001
1534	29058	6720	29046	6721	29034	6722	29012
1535	29069	6721	29057	6722	29045	6723	29023
1536	29080	6722	29068	6723	29056	6724	29034
1537	29091	6723	29079	6724	29067	6725	29045
1538	29102	6724	29090	6725	29078	6726	29056
1539	29113	6725	29101	6726	29089	6727	29067
1540	29124	6726	29112	6727	29100	6728	29078
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1575	29509	6761	29497	6762	29485	6763	29463
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1577	29531	6763	29519	6764	29507	6765	29485
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1582	29586	6768	29574	6769	29562	6770	29540
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1596	29740	6782	29728	6783	29716	6784	29694
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1600	29784	6786	29772	6787	29760	6788	29738

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1608	25968	6307	6307	6307	6307	6307	6307
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1623	25983	6322	6322	6322	6322	6322	6322
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1626	25986	6325	6325	6325	6325	6325	6325
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1628	25988	6327	6327	6327	6327	6327	6327
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1639	25999	6338	6338	6338	6338	6338	6338
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1932	6127	24.34	6125	24.33	6124	24.31	6122	24.29
1934	6119	24.28	6118	24.26	6117	24.25	6116	24.24
1936	6112	24.21	6110	24.20	6109	24.19	6108	24.18
1938	6105	24.15	6103	24.14	6102	24.13	6101	24.12
1940	6097	24.09	6096	24.08	6095	24.07	6094	24.06
1942	6090	24.03	6089	24.02	6088	24.02	6087	24.01
1944	6082	23.97	6081	23.96	6080	23.95	6079	23.94
1946	6075	23.91	6074	23.90	6073	23.89	6072	23.88
1948	6067	23.85	6067	23.84	6066	23.83	6065	23.82
1950	6060	23.79	6059	23.78	6058	23.77	6057	23.76
1952	6053	23.73	6052	23.72	6051	23.71	6050	23.70
1954	6045	23.67	6045	23.66	6044	23.65	6042	23.64
1956	6038	23.61	6037	23.60	6036	23.59	6035	23.58

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1687	5931	22*76
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1682	5945	22*87
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1664	6009	23*37
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6016	6015	23*42
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1663	6013	23*40
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5975	5975	23*10
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5996	5997	23*28
6003	6004	23*33
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6010	6011	23*39
6011	6012	23*40
6017	6018	23*45
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1692	5910	5909	5908	5907	5906	5905	5904	5903
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1694	5903	5902	5901	5900	5899	5898	5897	5896
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1710	5847	5846	5845	5844	5844	5843	5842	5841
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2194	2194	2193	2192	2191	2190	2192
2195	2195	2194	2193	2192	2191	2193
2196	2196	2195	2194	2193	2192	2194
2197	2197	2196	2195	2194	2193	2195
2198	2198	2197	2196	2195	2194	2196
2199	2199	2198	2197	2196	2195	2197
2200	2200	2199	2198	2197	2196	2198

1750	5714	5713	5712	5711	5711	1751
21°00	20°59	20°59	20°59	20°98	20°98	20°95
5707	5706	5706	5706	5705	5704	5703
20°94	20°93	20°93	20°93	20°92	20°91	20°91
1754	5701	5700	5699	5698	5698	5697
20°88	20°88	20°88	20°87	20°86	20°86	20°85
1756	5694	5693	5693	5692	5691	5690
20°83	20°82	20°82	20°81	20°81	20°80	20°79
1758	5688	5687	5686	5685	5685	5684
20°77	20°76	20°76	20°76	20°75	20°74	20°73
1760	5681	5681	5680	5679	5678	5677
20°71	20°71	20°71	20°70	20°69	20°68	20°68
1762	5675	5674	5673	5672	5672	5671
20°66	20°65	20°64	20°64	20°64	20°63	20°62
1764	5668	5668	5667	5666	5665	5664
20°60	20°59	20°59	20°59	20°58	20°57	20°56
1766	5662	5661	5660	5660	5659	5658
20°54	20°54	20°53	20°52	20°52	20°52	20°51
1768	5656	5655	5654	5653	5652	5652
20°49	20°48	20°47	20°47	20°46	20°46	20°45
1770	5649	5648	5648	5647	5646	5645
20°43	20°43	20°42	20°41	20°41	20°41	20°40
1772	5643	5642	5641	5640	5640	5639
20°38	20°37	20°36	20°36	20°36	20°35	20°34
1774	5636	5636	5635	5634	5633	5633
20°32	20°32	20°31	20°30	20°30	20°29	20°28
1776	5630	5629	5629	5628	5627	5626
20°27	20°26	20°25	20°25	20°24	20°23	20°23
1778	5624	5623	5622	5621	5621	5620
20°21	20°21	20°20	20°19	20°19	20°18	20°17

1808	5530	19°44'	5530	19°43'	5529	19°43'	5528	19°42'	5527	19°41'	5527	19°41'	5526	19°40'	5525	19°40'
1806	5537	19°49'	5536	19°48'	5535	19°48'	5534	19°47'	5534	19°46'	5533	19°46'	5532	19°45'	5531	19°45'
1804	5543	19°54'	5542	19°53'	5541	19°53'	5540	19°52'	5540	19°51'	5539	19°51'	5538	19°50'	5537	19°50'
1802	5549	19°59'	5548	19°58'	5547	19°58'	5547	19°57'	5546	19°56'	5545	19°56'	5544	19°55'	5544	19°55'
1800	5555	19°64'	5554	19°63'	5554	19°63'	5553	19°62'	5552	19°61'	5551	19°61'	5550	19°60'	5550	19°60'
1798	5561	19°69'	5560	19°68'	5560	19°68'	5559	19°67'	5558	19°67'	5557	19°66'	5557	19°65'	5556	19°65'
1796	5567	19°74'	5567	19°74'	5566	19°73'	5565	19°72'	5564	19°72'	5564	19°71'	5563	19°70'	5562	19°70'
1794	5574	19°79'	5573	19°79'	5572	19°78'	5571	19°77'	5571	19°77'	5570	19°76'	5569	19°75'	5568	19°75'
1792	5580	19°84'	5579	19°84'	5578	19°83'	5578	19°83'	5577	19°82'	5576	19°81'	5575	19°81'	5574	19°80'
1790	5586	19°89'	5585	19°88'	5585	19°88'	5584	19°88'	5583	19°87'	5582	19°86'	5581	19°86'	5581	19°85'
1788	5592	19°95'	5592	19°94'	5591	19°93'	5590	19°93'	5589	19°92'	5588	19°92'	5588	19°91'	5587	19°90'
1786	5599	20°00'	5598	19°99'	5597	19°99'	5596	19°98'	5595	19°97'	5595	19°97'	5594	19°96'	5593	19°95'
1784	5605	20°05'	5604	20°05'	5603	20°04'	5603	20°03'	5602	20°03'	5601	20°02'	5600	20°01'	5599	20°01'
1782	5611	20°11'	5610	20°10'	5610	20°09'	5609	20°09'	5608	20°08'	5607	20°07'	5606	20°07'	5606	20°06'
1780	5617	20°16'	5617	20°15'	5615	20°15'	5615	20°14'	5614	20°13'	5614	20°13'	5613	20°12'	5612	20°11'

1810	5524	19.39	5524	19.38	5522	19.37	5521	19.36	5521
1812	5518	19.34	5518	19.33	5517	19.32	5516	19.31	5515
1814	5512	19.29	5511	19.28	5511	19.27	5509	19.27	5507
1816	5506	19.24	5505	19.23	5504	19.22	5503	19.22	5501
1818	5500	19.19	5499	19.18	5498	19.17	5497	19.17	5495
1820	5494	19.14	5493	19.13	5492	19.12	5491	19.12	5489
1822	5488	19.10	5487	19.08	5486	19.08	5485	19.07	5483
1824	5482	19.05	5481	19.04	5480	19.03	5479	19.02	5477
1826	5476	19.00	5475	18.99	5474	18.98	5473	18.97	5471
1828	5470	18.96	5469	18.95	5468	18.94	5467	18.93	5465
1830	5464	18.92	5463	18.91	5462	18.90	5461	18.89	5460
1832	5458	18.87	5457	18.86	5456	18.85	5455	18.84	5454
1834	5452	18.83	5451	18.82	5450	18.81	5449	18.80	5448
1836	5446	18.79	5445	18.78	5444	18.77	5443	18.76	5442
1838	5440	18.74	5439	18.73	5438	18.72	5437	18.71	5436

1840	5434	5474	5432	5432	1840
1841	5431	5431	5431	5431	1841
1842	5428	5427	5426	5425	1842
1843	5428	5427	5426	5425	1843
1844	5422	5421	5420	5419	1844
1845	5417	5416	5414	5413	1845
1846	5417	5416	5414	5413	1846
1847	5415	5414	5414	5413	1847
1848	5410	5409	5409	5408	1848
1849	5410	5409	5409	5408	1849
1850	5405	5403	5403	5402	1850
1851	5400	5400	5400	5400	1851
1852	5399	5398	5397	5396	1852
1853	5398	5398	5397	5396	1853
1854	5393	5392	5391	5390	1854
1855	5393	5392	5391	5390	1855
1856	5387	5386	5385	5385	1856
1857	5387	5386	5385	5385	1857
1858	5382	5380	5379	5378	1858
1859	5381	5380	5379	5378	1859
1860	5376	5374	5374	5373	1860
1861	5375	5374	5374	5373	1861
1862	5370	5369	5368	5367	1862
1863	5369	5369	5368	5367	1863
1864	5364	5363	5362	5361	1864
1865	5364	5363	5362	5361	1865
1866	5359	5357	5356	5355	1866
1867	5358	5357	5356	5355	1867
1868	5353	5351	5351	5350	1868
1869	5352	5351	5351	5350	1869
1870	5349	5348	5347	5346	1870
1871	5348	5347	5346	5345	1871
1872	5342	5341	5340	5339	1872
1873	5342	5341	5340	5339	1873
1874	5337	5336	5335	5334	1874
1875	5336	5335	5334	5333	1875
1876	5331	5330	5329	5328	1876
1877	5330	5329	5328	5327	1877
1878	5325	5324	5323	5322	1878
1879	5324	5323	5322	5321	1879
1880	5319	5318	5317	5316	1880
1881	5318	5317	5316	5315	1881
1882	5312	5311	5310	5309	1882
1883	5311	5310	5309	5308	1883
1884	5306	5305	5304	5303	1884
1885	5305	5304	5303	5302	1885
1886	5299	5298	5297	5296	1886
1887	5298	5297	5296	5295	1887
1888	5292	5291	5290	5289	1888
1889	5291	5290	5289	5288	1889
1890	5286	5285	5284	5283	1890
1891	5285	5284	5283	5282	1891
1892	5279	5278	5277	5276	1892
1893	5278	5277	5276	5275	1893
1894	5272	5271	5270	5269	1894
1895	5271	5270	5269	5268	1895
1896	5265	5264	5263	5262	1896
1897	5264	5263	5262	5261	1897
1898	5258	5257	5256	5255	1898
1899	5257	5256	5255	5254	1899
1900	5251	5250	5249	5248	1900
1901	5250	5249	5248	5247	1901
1902	5244	5243	5242	5241	1902
1903	5243	5242	5241	5240	1903
1904	5237	5236	5235	5234	1904
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1906	5230	5229	5228	5227	1906
1907	5229	5228	5227	5226	1907
1908	5223	5222	5221	5220	1908
1909	5222	5221	5220	5219	1909
1910	5216	5215	5214	5213	1910
1911	5215	5214	5213	5212	1911
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1913	5208	5207	5206	5205	1913
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1916	5195	5194	5193	5192	1916
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1922	5174	5173	5172	5171	1922
1923	5173	5172	5171	5170	1923
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1926	5160	5159	5158	5157	1926
1927	5159	5158	5157	5156	1927
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1937	5124	5123	5122	5121	1937
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1940	5111	5110	5109	5108	1940
1941	5110	5109	5108	5107	1941
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1944	5097	5096	5095	5094	1944
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1947	5089	5088	5087	5086	1947
1948	5083	5082	5081	5080	1948
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1951	5075	5074	5073	5072	1951
1952	5069	5068	5067	5066	1952
1953	5068	5067	5066	5065	1953
1954	5062	5061	5060	5059	1954
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1956	5055	5054	5053	5052	1956
1957	5054	5053	5052	5051	1957
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1964	5027	5026	5025	5024	1964
1965	5026	5025	5024	5023	1965
1966	5020	5019	5018	5017	1966
1967	5019	5018	5017	5016	1967
1968	5013	5012	5011	5010	1968
1969	5012	5011	5010	5009	1969
1970	5006	5005	5004	5003	1970
1971	5005	5004	5003	5002	1971
1972	4999	4998	4997	4996	1972
1973	4998	4997	4996	4995	1973
1974	4992	4991	4990	4989	1974
1975	4991	4990	4989	4988	1975
1976	4985	4984	4983	4982	1976
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1981	4970	4969	4968	4967	1981
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1996	4915	4914	4913	4912	1996
1997	4914	4913	4912	4911	1997
1998	4908	4907	4906	4905	1998
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2005	4886	4885	4884	4883	2005
2006	4880	4879	4878	4877	2006
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2008	4873	4872	4871	4870	2008
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2018	4838	4837	4836	4835	2018
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1960	5092	5091	5090	5089	5088	5087	5086	5085	5084
1961	5092	5091	5090	5089	5088	5087	5086	5085	5084
1962	5086	5085	5084	5083	5082	5081	5080	5079	5078
1963	5086	5085	5084	5083	5082	5081	5080	5079	5078
1964	5080	5079	5078	5077	5076	5075	5074	5073	5072
1965	5080	5079	5078	5077	5076	5075	5074	5073	5072
1966	5074	5073	5072	5071	5070	5069	5068	5067	5066
1967	5074	5073	5072	5071	5070	5069	5068	5067	5066
1968	5068	5067	5066	5065	5064	5063	5062	5061	5060
1969	5068	5067	5066	5065	5064	5063	5062	5061	5060
1970	5062	5061	5060	5059	5058	5057	5056	5055	5054
1971	5062	5061	5060	5059	5058	5057	5056	5055	5054
1972	5056	5055	5054	5053	5052	5051	5050	5049	5048
1973	5056	5055	5054	5053	5052	5051	5050	5049	5048
1974	5050	5049	5048	5047	5046	5045	5044	5043	5042
1975	5050	5049	5048	5047	5046	5045	5044	5043	5042
1976	5044	5043	5042	5041	5040	5039	5038	5037	5036
1977	5044	5043	5042	5041	5040	5039	5038	5037	5036
1978	5038	5037	5036	5035	5034	5033	5032	5031	5030
1979	5038	5037	5036	5035	5034	5033	5032	5031	5030
1980	5032	5031	5030	5029	5028	5027	5026	5025	5024
1981	5032	5031	5030	5029	5028	5027	5026	5025	5024
1982	5026	5025	5024	5023	5022	5021	5020	5019	5018
1983	5026	5025	5024	5023	5022	5021	5020	5019	5018
1984	5020	5019	5018	5017	5016	5015	5014	5013	5012
1985	5020	5019	5018	5017	5016	5015	5014	5013	5012
1986	5014	5013	5012	5011	5010	5009	5008	5007	5006
1987	5014	5013	5012	5011	5010	5009	5008	5007	5006
1988	5008	5007	5006	5005	5004	5003	5002	5001	5000
1989	5008	5007	5006	5005	5004	5003	5002	5001	5000
1990	5002	5001	5000	4999	4998	4997	4996	4995	4994
1991	5002	5001	5000	4999	4998	4997	4996	4995	4994
1992	4996	4995	4994	4993	4992	4991	4990	4989	4988
1993	4996	4995	4994	4993	4992	4991	4990	4989	4988
1994	4990	4989	4988	4987	4986	4985	4984	4983	4982
1995	4990	4989	4988	4987	4986	4985	4984	4983	4982
1996	4984	4983	4982	4981	4980	4979	4978	4977	4976
1997	4984	4983	4982	4981	4980	4979	4978	4977	4976
1998	4978	4977	4976	4975	4974	4973	4972	4971	4970
1999	4978	4977	4976	4975	4974	4973	4972	4971	4970
2000	4972	4971	4970	4969	4968	4967	4966	4965	4964
2001	4972	4971	4970	4969	4968	4967	4966	4965	4964

1930	5180	16.49	5180	16.49	5179	16.48	5178	16.47	5177	16.47	5176	16.46
1932	5175	16.45	5175	16.45	5174	16.44	5173	16.43	5172	16.43	5171	16.41
1934	5170	16.41	5169	16.40	5169	16.39	5168	16.39	5167	16.38	5165	16.37
1936	5165	16.36	5164	16.36	5163	16.35	5163	16.35	5162	16.34	5161	16.33
1938	5159	16.32	5159	16.31	5158	16.31	5157	16.30	5157	16.29	5155	16.28
1940	5154	16.27	5153	16.27	5153	16.26	5152	16.26	5151	16.25	5149	16.23
1942	5149	16.23	5148	16.22	5148	16.22	5147	16.21	5146	16.20	5145	16.19
1944	5144	16.18	5143	16.18	5142	16.17	5142	16.16	5141	16.16	5140	16.15
1946	5138	16.14	5138	16.13	5137	16.12	5136	16.12	5136	16.11	5134	16.10
1948	5133	16.09	5132	16.09	5132	16.08	5131	16.07	5130	16.06	5129	16.05
1950	5128	16.05	5127	16.04	5126	16.03	5126	16.03	5125	16.02	5124	16.01
1952	5122	16.00	5122	15.99	5121	15.99	5120	15.98	5120	15.97	5119	15.96
1954	5117	15.96	5117	15.95	5116	15.94	5115	15.94	5115	15.93	5114	15.92
1956	5112	15.91	5111	15.90	5111	15.90	5110	15.89	5109	15.88	5108	15.87
1958	5107	15.87	5106	15.86	5105	15.85	5105	15.85	5104	15.84	5103	15.83

1988	15.18	5030	15.18
1986	15.23	5035	15.23
1984	15.28	5040	15.28
1982	15.32	5045	15.32
1980	15.37	5050	15.37
1978	15.41	5055	15.41
1976	15.46	5060	15.46
1974	15.50	5065	15.50
1972	15.55	5070	15.55
1970	15.59	5076	15.59
1968	15.64	5081	15.64
1966	15.68	5086	15.68
1964	15.73	5091	15.73
1962	15.77	5096	15.77
1960	15.82	5102	15.82
1959	15.81	5100	15.81
1958	15.80	5099	15.80
1957	15.79	5098	15.79
1956	15.78	5097	15.78
1955	15.77	5096	15.77
1954	15.76	5095	15.76
1953	15.75	5094	15.75
1952	15.74	5093	15.74
1951	15.73	5092	15.73
1950	15.72	5091	15.72
1949	15.71	5090	15.71
1948	15.70	5089	15.70
1947	15.69	5088	15.69
1946	15.68	5087	15.68
1945	15.67	5086	15.67
1944	15.66	5085	15.66
1943	15.65	5084	15.65
1942	15.64	5083	15.64
1941	15.63	5082	15.63
1940	15.62	5081	15.62
1939	15.61	5080	15.61
1938	15.60	5079	15.60
1937	15.59	5078	15.59
1936	15.58	5077	15.58
1935	15.57	5076	15.57
1934	15.56	5075	15.56
1933	15.55	5074	15.55
1932	15.54	5073	15.54
1931	15.53	5072	15.53
1930	15.52	5071	15.52
1929	15.51	5070	15.51
1928	15.50	5069	15.50
1927	15.49	5068	15.49
1926	15.48	5067	15.48
1925	15.47	5066	15.47
1924	15.46	5065	15.46
1923	15.45	5064	15.45
1922	15.44	5063	15.44
1921	15.43	5062	15.43
1920	15.42	5061	15.42
1919	15.41	5060	15.41
1918	15.40	5059	15.40
1917	15.39	5058	15.39
1916	15.38	5057	15.38
1915	15.37	5056	15.37
1914	15.36	5055	15.36
1913	15.35	5054	15.35
1912	15.34	5053	15.34
1911	15.33	5052	15.33
1910	15.32	5051	15.32
1909	15.31	5050	15.31
1908	15.30	5049	15.30
1907	15.29	5048	15.29
1906	15.28	5047	15.28
1905	15.27	5046	15.27
1904	15.26	5045	15.26
1903	15.25	5044	15.25
1902	15.24	5043	15.24
1901	15.23	5042	15.23
1900	15.22	5041	15.22
1899	15.21	5040	15.21
1898	15.20	5039	15.20
1897	15.19	5038	15.19
1896	15.18	5037	15.18
1895	15.17	5036	15.17
1894	15.16	5035	15.16
1893	15.15	5034	15.15
1892	15.14	5033	15.14
1891	15.13	5032	15.13
1890	15.12	5031	15.12
1889	15.11	5030	15.11
1888	15.10	5029	15.10
1887	15.09	5028	15.09
1886	15.08	5027	15.08
1885	15.07	5026	15.07
1884	15.06	5025	15.06
1883	15.05	5024	15.05
1882	15.04	5023	15.04
1881	15.03	5022	15.03
1880	15.02	5021	15.02
1879	15.01	5020	15.01
1878	15.00	5019	15.00
1877	14.99	5018	14.99
1876	14.98	5017	14.98
1875	14.97	5016	14.97
1874	14.96	5015	14.96
1873	14.95	5014	14.95
1872	14.94	5013	14.94
1871	14.93	5012	14.93
1870	14.92	5011	14.92
1869	14.91	5010	14.91
1868	14.90	5009	14.90
1867	14.89	5008	14.89
1866	14.88	5007	14.88
1865	14.87	5006	14.87
1864	14.86	5005	14.86
1863	14.85	5004	14.85
1862	14.84	5003	14.84
1861	14.83	5002	14.83
1860	14.82	5001	14.82
1859	14.81	5000	14.81
1858	14.80	4999	14.80
1857	14.79	4998	14.79
1856	14.78	4997	14.78
1855	14.77	4996	14.77
1854	14.76	4995	14.76
1853	14.75	4994	14.75
1852	14.74	4993	14.74
1851	14.73	4992	14.73
1850	14.72	4991	14.72
1849	14.71	4990	14.71
1848	14.70	4989	14.70
1847	14.69	4988	14.69
1846	14.68	4987	14.68
1845	14.67	4986	14.67
1844	14.66	4985	14.66
1843	14.65	4984	14.65
1842	14.64	4983	14.64
1841	14.63	4982	14.63
1840	14.62	4981	14.62
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1836	14.58	4977	14.58
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1834	14.56	4975	14.56
1833	14.55	4974	14.55
1832	14.54	4973	14.54
1831	14.53	4972	14.53
1830	14.52	4971	14.52
1829	14.51	4970	14.51
1828	14.50	4969	14.50
1827	14.49	4968	14.49
1826	14.48	4967	14.48
1825	14.47	4966	14.47
1824	14.46	4965	14.46
1823	14.45	4964	14.45
1822	14.44	4963	14.44
1821	14.43	4962	14.43
1820	14.42	4961	14.42
1819	14.41	4960	14.41
1818	14.40	4959	14.40
1817	14.39	4958	14.39
1816	14.38	4957	14.38
1815	14.37	4956	14.37
1814	14.36	4955	14.36
1813	14.35	4954	14.35
1812	14.34	4953	14.34
1811	14.33	4952	14.33
1810	14.32	4951	14.32
1809	14.31	4950	14.31
1808	14.30	4949	14.30
1807	14.29	4948	14.29
1806	14.28	4947	14.28
1805	14.27	4946	14.27
1804	14.26	4945	14.26
1803	14.25	4944	14.25
1802	14.24	4943	14.24
1801	14.23	4942	14.23
1800	14.22	4941	14.22
1799	14.21	4940	14.21
1798	14.20	4939	14.20
1797	14.19	4938	14.19
1796	14.18	4937	14.18
1795	14.17	4936	14.17
1794	14.16	4935	14.16
1793	14.15	4934	14.15
1792	14.14	4933	14.14
1791	14.13	4932	14.13
1790	14.12	4931	14.12
1789	14.11	4930	14.11
1788	14.10	4929	14.10
1787	14.09	4928	14.09
1786	14.08	4927	14.08
1785	14.07	4926	14.07
1784	14.06	4925	14.06
1783	14.05	4924	14.05
1782	14.04	4923	14.04
1781	14.03	4922	14.03
1780	14.02	4921	14.02
1779	14.01	4920	14.01
1778	14.00	4919	14.00
1777	13.99	4918	13.99
1776	13.98	4917	13.98
1775	13.97	4916	13.97
1774	13.96	4915	13.96
1773	13.95	4914	13.95
1772	13.94	4913	13.94
1771	13.93	4912	13.93
1770	13.92	4911	13.92
1769	13.91	4910	13.91
1768	13.90	4909	13.90
1767	13.89	4908	13.89
1766	13.88	4907	13.88
1765	13.87	4906	13.87
1764	13.86	4905	13.86
1763	13.85	4904	13.85
1762	13.84	4903	13.84
1761	13.83	4902	13.83
1760	13.82	4901	13.82
1759	13.81	4900	13.81
1758	13.80	4899	13.80
1757	13.79	4898	13.79
1756	13.78	4897	13.78
1755	13.77	4896	13.77
1754	13.76	4895	13.76
1753	13.75	4894	13.75
1752	13.74	4893	13.74
1751	13.73	4892	13.73
1750	13.72	4891	13.72
1749	13.71	4890	13.71
1748	13.70	4889	13.70
1747	13.69	4888	13.69
1746	13.68	4887	13.68
1745	13.67	4886	13.67
1744	13.66	4885	13.66
1743	13.65	4884	13.65
1742	13.64	4883	13.64
1741	13.63	4882	13.63
1740	13.62	4881	13.62
1739	13.61	4880	13.61
1738	13.60	4879	13.60
1737	13.59	4878	13.59
1736	13.58	4877	13.58
1735	13.57	4876	13.57
1734	13.56	4875	13.56
1733	13.55	4874	13.55
1732	13.54	4873	13.54
1731	13.53	4872	13.53
1730	13.52	4871	13.52
1729	13.51	4870	13.51
1728	13.50	4869	13.50
1727	13.49	4868	13.49
1726	13.48	4867	13.48
1725	13.47	4866	13.47
1724	13.46	4865	13.46
1723	13.45	4864	13.45
1722	13.44	4863	13.44
1721	13.43	4862	13.43
1720	13.42	4861	13.42
1719	13.41	4860	13.41
1718	13.40	4859	13.40
1717	13.39	4858	13.39
1716	13.38	4857	13.38
1715	13.37	4856	13.37
1714	13.36	4855	13.36
1713	13.35	4854	13.35
1712	13.34	4853	13.34
1711	13.33	4852	13.33
1710	13.32	4851	13.32
1709	13.31	4850	13.31
1708	13.30	4849	13.30
1707	13.29	4848	13.29
1706	13.28	4847	13.28
1705	13.27	4846	13.27
1704	13.26	4845	13.26
1703	13.25	4844	13.25
1702	13.24	4843	13.24
1701	13.23	4842	13.23
1700	13.22	4841	13.22
1699	13.21	4840	13.21
1698	13.20	4839	13.20
1697	13.19	4838	13.19
1696	13.18	4837	13.18
1695	13.17	4836	13.17
1694	13.16	4835	13.16
1693	13.15	4834	13.15
1692	13.14	4833	13.14
1691	13.13	4832	13.13
1690	13.12	4831	13.12
1689	13.11	4830	13.11
1688	13.10	4829	13.10

1990	5025	5024	5023	5023	5022	5021	5021	5020
1991	5023	5023	5023	5023	5022	5021	5021	5020
1992	5018	5018	5018	5018	5017	5016	5016	5015
1993	5018	5018	5018	5018	5017	5016	5016	5015
1994	5013	5014	5013	5013	5012	5011	5011	5010
1995	5013	5013	5013	5013	5012	5011	5011	5010
1996	5008	5009	5008	5008	5007	5006	5006	5005
1997	5008	5008	5008	5008	5007	5006	5006	5005
1998	5003	5004	5003	5003	5002	5001	5001	5000
1999	5003	5003	5003	5003	5002	5001	5001	5000
2000	4998	4999	4998	4998	4997	4996	4996	4995
2001	4998	4998	4998	4998	4997	4996	4996	4995
2002	4993	4994	4993	4993	4992	4991	4991	4990
2003	4993	4993	4993	4992	4992	4991	4991	4990
2004	4988	4989	4988	4988	4987	4986	4986	4985
2005	4988	4988	4988	4987	4986	4986	4986	4985
2006	4983	4984	4983	4983	4982	4981	4981	4980
2007	4983	4983	4983	4982	4982	4981	4981	4980
2008	4978	4979	4978	4978	4977	4976	4976	4975
2009	4978	4978	4978	4977	4976	4976	4976	4975
2010	4974	4974	4973	4973	4972	4972	4971	4970
2011	4973	4973	4973	4972	4972	4972	4971	4970
2012	4968	4969	4968	4968	4967	4967	4966	4965
2013	4968	4968	4968	4967	4967	4967	4966	4965
2014	4964	4964	4964	4963	4962	4962	4961	4960
2015	4963	4963	4963	4962	4962	4962	4961	4960
2016	4959	4959	4959	4958	4957	4957	4956	4956
2017	4958	4958	4958	4957	4957	4957	4956	4956
2018	4954	4954	4954	4953	4952	4952	4951	4951
2019	4953	4953	4953	4952	4952	4952	4951	4951
2020	4953	4953	4952	4952	4951	4951	4951	4950
2021	4952	4952	4952	4951	4951	4951	4951	4950
2022	4952	4952	4952	4951	4951	4951	4951	4950
2023	4952	4952	4952	4951	4951	4951	4951	4950
2024	4952	4952	4952	4951	4951	4951	4951	4950
2025	4952	4952	4952	4951	4951	4951	4951	4950
2026	4952	4952	4952	4951	4951	4951	4951	4950
2027	4952	4952	4952	4951	4951	4951	4951	4950
2028	4952	4952	4952	4951	4951	4951	4951	4950
2029	4952	4952	4952	4951	4951	4951	4951	4950
2030	4952	4952	4952	4951	4951	4951	4951	4950

2020	4950	14.43	4949	14.42	4948	14.41	4947	14.40	4946
2022	4945	14.38	4944	14.37	4943	14.36	4942	14.35	4941
2024	4940	14.34	4939	14.33	4938	14.32	4937	14.31	4936
2026	4935	14.29	4934	14.28	4933	14.27	4932	14.26	4931
2028	4930	14.24	4929	14.23	4928	14.22	4927	14.21	4926
2030	4925	14.20	4924	14.19	4923	14.18	4922	14.17	4921
2032	4920	14.15	4919	14.14	4918	14.13	4917	14.12	4917
2034	4915	14.11	4914	14.10	4913	14.09	4912	14.08	4912
2036	4910	14.06	4909	14.05	4908	14.04	4907	14.03	4907
2038	4905	14.02	4904	14.01	4903	14.00	4902	13.99	4902
2040	4900	13.97	4899	13.96	4898	13.95	4897	13.94	4897
2042	4895	13.93	4894	13.92	4893	13.91	4892	13.90	4892
2044	4890	13.88	4889	13.87	4888	13.86	4887	13.85	4887
2046	4885	13.84	4884	13.83	4883	13.82	4882	13.81	4882
2048	4880	13.80	4879	13.79	4878	13.78	4877	13.77	4877

2050	4878	13°16	4811	13°15	4811	13°14	4810	13°14	4810	13°13	4809	13°13	4808	13°12	4808	13°12
2051	4875	13°14	4875	13°14	4875	13°14	4875	13°14	4875	13°14	4875	13°14	4875	13°14	4875	13°14
2052	4873	13°17	4872	13°17	4872	13°17	4871	13°17	4871	13°17	4870	13°17	4869	13°17	4869	13°17
2053	4873	13°17	4872	13°17	4872	13°17	4871	13°17	4871	13°17	4870	13°17	4869	13°17	4869	13°17
2054	4868	13°68	4867	13°67	4867	13°67	4866	13°66	4866	13°66	4865	13°65	4864	13°64	4864	13°64
2055	4868	13°68	4867	13°67	4867	13°67	4866	13°66	4866	13°66	4865	13°65	4864	13°64	4864	13°64
2056	4863	13°64	4863	13°63	4862	13°63	4862	13°62	4861	13°61	4860	13°61	4860	13°60	4860	13°60
2057	4863	13°64	4863	13°63	4862	13°63	4862	13°62	4861	13°61	4860	13°61	4860	13°60	4860	13°60
2058	4859	13°59	4858	13°59	4857	13°58	4857	13°58	4856	13°57	4856	13°57	4855	13°56	4855	13°56
2059	4859	13°59	4858	13°59	4857	13°58	4857	13°58	4856	13°57	4856	13°57	4855	13°56	4855	13°56
2060	4854	13°55	4853	13°54	4853	13°54	4852	13°53	4852	13°53	4851	13°52	4850	13°52	4850	13°52
2061	4854	13°55	4853	13°54	4853	13°54	4852	13°53	4852	13°53	4851	13°52	4850	13°52	4850	13°52
2062	4849	13°51	4849	13°50	4848	13°49	4847	13°49	4847	13°48	4846	13°48	4846	13°47	4845	13°47
2063	4849	13°51	4849	13°50	4848	13°49	4847	13°49	4847	13°48	4846	13°48	4846	13°47	4845	13°47
2064	4844	13°46	4844	13°46	4843	13°45	4843	13°45	4842	13°44	4842	13°44	4841	13°43	4840	13°42
2065	4844	13°46	4844	13°46	4843	13°45	4843	13°45	4842	13°44	4842	13°44	4841	13°43	4840	13°42
2066	4840	13°42	4839	13°41	4839	13°41	4838	13°40	4837	13°40	4837	13°39	4836	13°38	4836	13°38
2067	4840	13°42	4839	13°41	4839	13°41	4838	13°40	4837	13°40	4837	13°39	4836	13°38	4836	13°38
2068	4835	13°37	4835	13°37	4834	13°36	4833	13°36	4833	13°35	4832	13°35	4832	13°34	4831	13°34
2069	4835	13°37	4835	13°37	4834	13°36	4833	13°36	4833	13°35	4832	13°35	4832	13°34	4831	13°34
2070	4830	13°33	4830	13°33	4829	13°32	4829	13°31	4828	13°31	4828	13°30	4827	13°30	4826	13°29
2071	4830	13°33	4830	13°33	4829	13°32	4829	13°31	4828	13°31	4828	13°30	4827	13°30	4826	13°29
2072	4826	13°29	4825	13°28	4825	13°28	4824	13°27	4823	13°27	4823	13°26	4822	13°25	4822	13°25
2073	4826	13°29	4825	13°28	4825	13°28	4824	13°27	4823	13°27	4823	13°26	4822	13°25	4822	13°25
2074	4821	13°24	4821	13°24	4820	13°23	4819	13°23	4819	13°22	4818	13°22	4818	13°21	4817	13°20
2075	4821	13°24	4821	13°24	4820	13°23	4819	13°23	4819	13°22	4818	13°22	4818	13°21	4817	13°20
2076	4816	13°20	4816	13°19	4815	13°19	4815	13°18	4814	13°18	4814	13°17	4813	13°17	4812	13°16
2077	4816	13°20	4816	13°19	4815	13°19	4815	13°18	4814	13°18	4814	13°17	4813	13°17	4812	13°16
2078	4812	13°16	4811	13°15	4811	13°14	4810	13°14	4810	13°13	4809	13°13	4808	13°12	4808	13°12

2080	4807	4807	4806	4805	4805	4805	2081
13.11	13.11	13.10	13.10	13.09	13.09	13.09	13.07
4803	4802	4801	4801	4801	4800	4800	2082
13.07	13.06	13.06	13.06	13.05	13.05	13.04	13.03
4798	4797	4797	4796	4796	4796	4795	2084
13.02	13.02	13.01	13.01	13.01	13.00	12.99	12.98
4793	4793	4792	4792	4792	4791	4790	2086
12.98	12.97	12.97	12.97	12.96	12.96	12.95	12.94
4789	4788	4788	4788	4787	4786	4785	2088
12.93	12.93	12.92	12.92	12.92	12.91	12.90	12.89
4784	4784	4783	4782	4782	4781	4781	2090
12.89	12.88	12.88	12.87	12.87	12.87	12.86	12.85
4780	4779	4778	4778	4777	4777	4776	2092
12.84	12.84	12.83	12.83	12.82	12.81	12.81	12.80
4775	4774	4774	4773	4773	4772	4772	2094
12.80	12.79	12.79	12.78	12.77	12.77	12.76	12.75
4770	4770	4769	4769	4768	4768	4767	2096
12.75	12.75	12.74	12.74	12.73	12.72	12.72	12.71
4766	4765	4764	4764	4764	4763	4763	2098
12.71	12.70	12.70	12.69	12.68	12.68	12.67	12.67
4761	4761	4760	4760	4759	4759	4758	2100
12.66	12.66	12.65	12.64	12.64	12.63	12.63	12.62
4757	4756	4756	4755	4755	4754	4753	2102
12.62	12.61	12.61	12.60	12.59	12.59	12.58	12.58
4752	4752	4751	4751	4750	4750	4749	2104
12.57	12.57	12.56	12.55	12.55	12.54	12.54	12.53
4748	4747	4747	4746	4746	4745	4744	2106
12.53	12.52	12.51	12.51	12.50	12.50	12.49	12.49
4743	4743	4742	4742	4741	4741	4740	2108
12.48	12.47	12.47	12.46	12.46	12.45	12.45	12.44

2110	4736	12.43	4736	12.40	4735	12.39
2112	4734	12.39	4734	12.38	4730	12.35
2114	4730	12.34	4729	12.33	4726	12.30
2116	4725	12.29	4724	12.28	4721	12.26
2118	4721	12.25	4720	12.24	4717	12.21
2120	4716	12.20	4715	12.19	4713	12.17
2122	4712	12.16	4711	12.15	4708	12.12
2124	4708	12.11	4706	12.10	4704	12.07
2126	4703	12.07	4702	12.06	4699	12.03
2128	4699	12.02	4698	12.01	4695	11.99
2130	4694	11.97	4693	11.96	4690	11.94
2132	4689	11.92	4688	11.91	4686	11.89
2134	4686	11.88	4684	11.87	4682	11.84
2136	4681	11.83	4680	11.82	4678	11.80
2138	4677	11.79	4676	11.78	4673	11.75
2139	4675	11.77	4674	11.76	4673	11.76
2137	4679	11.81	4678	11.81	4677	11.80
2135	4683	11.86	4683	11.86	4682	11.85
2133	4688	11.91	4688	11.91	4687	11.90
2131	4692	11.95	4692	11.95	4691	11.94
2129	4697	12.00	4696	11.99	4695	11.99
2127	4701	12.05	4700	12.04	4700	12.03
2125	4705	12.09	4705	12.09	4704	12.08
2123	4710	12.14	4709	12.13	4709	12.13
2121	4714	12.18	4714	12.18	4713	12.17
2119	4719	12.23	4718	12.22	4718	12.21
2117	4723	12.27	4723	12.27	4722	12.26
2115	4728	12.32	4727	12.32	4727	12.31
2113	4732	12.37	4732	12.37	4731	12.35
2111	4737	12.42	4736	12.41	4735	12.39

2190	4672	4672	11°74	11°74	4671	4671	11°73	11°73	4671	4671	11°08	11°08
2142	4668	4667	11°70	11°69	4667	4667	11°69	11°69	4667	4667	11°08	11°08
2144	4664	4663	11°65	11°65	4663	4663	11°64	11°64	4663	4663	11°08	11°08
2146	4659	4659	11°60	11°60	4658	4658	11°59	11°59	4658	4658	11°08	11°08
2148	4655	4654	11°56	11°55	4654	4654	11°55	11°55	4653	4653	11°08	11°08
2150	4651	4650	11°51	11°51	4650	4650	11°50	11°50	4649	4649	11°07	11°07
2152	4646	4645	11°47	11°46	4645	4645	11°45	11°45	4644	4644	11°07	11°07
2154	4642	4641	11°42	11°41	4641	4641	11°41	11°41	4640	4640	11°07	11°07
2156	4638	4637	11°37	11°37	4637	4637	11°36	11°36	4636	4636	11°07	11°07
2158	4633	4632	11°33	11°32	4632	4632	11°31	11°31	4631	4631	11°07	11°07
2160	4629	4629	11°28	11°27	4628	4628	11°26	11°26	4627	4627	11°07	11°07
2162	4625	4624	11°23	11°23	4624	4624	11°22	11°22	4623	4623	11°07	11°07
2164	4621	4620	11°19	11°18	4620	4620	11°17	11°17	4618	4618	11°06	11°06
2166	4616	4616	11°14	11°13	4615	4615	11°12	11°12	4614	4614	11°06	11°06
4612	4612	4611	11°09	11°09	4611	4611	11°08	11°08	4610	4610	11°06	11°06

2170	4608	11°05	4607	11°04	4607	11°03	4606	11°03	4606	11°02	4605	11°02	4605	11°01	4604	11°01
2172	4604	11°00	4603	10°99	4602	10°98	4602	10°98	4601	10°98	4601	10°97	4600	10°97	4600	10°96
2174	4599	10°96	4599	10°95	4598	10°94	4598	10°94	4597	10°94	4597	10°93	4596	10°93	4596	10°92
2176	4595	10°92	4595	10°91	4594	10°90	4594	10°90	4593	10°89	4592	10°89	4591	10°88	4591	10°88
2178	4591	10°87	4590	10°87	4589	10°86	4589	10°86	4589	10°85	4588	10°85	4587	10°84	4587	10°83
2180	4587	10°83	4586	10°82	4585	10°81	4585	10°81	4584	10°80	4584	10°80	4583	10°79	4583	10°79
2182	4582	10°79	4581	10°77	4581	10°77	4580	10°76	4580	10°76	4579	10°75	4579	10°75	4579	10°75
2184	4578	10°74	4577	10°73	4577	10°72	4576	10°72	4576	10°71	4575	10°71	4575	10°70	4575	10°70
2186	4574	10°7	4573	10°69	4572	10°68	4572	10°67	4571	10°67	4571	10°66	4570	10°66	4570	10°66
21	4569	10°65	4569	10°64	4568	10°63	4568	10°63	4567	10°62	4567	10°62	4566	10°61	4566	10°61
190	4566	10°61	4565	10°59	4564	10°59	4564	10°58	4563	10°58	4563	10°57	4562	10°57	4562	10°57
2192	4562	10°56	4561	10°55	4560	10°54	4559	10°54	4559	10°53	4558	10°53	4558	10°52	4558	10°52
2194	4557	10°51	4556	10°50	4556	10°50	4555	10°49	4555	10°48	4554	10°48	4554	10°47	4554	10°47
2196	4553	10°47	4552	10°45	4551	10°44	4551	10°44	4551	10°44	4550	10°43	4550	10°43	4550	10°43
2198	4549	10°42	4548	10°41	4548	10°40	4547	10°39	4547	10°39	4546	10°38	4545	10°38	4545	10°38

2290	4366	4366	4365	4365	4365	4366	7.03
2292	4363	4362	4361	4361	4362	4362	7.25
2294	4359	4358	4357	4357	4358	4358	7.18
2296	4355	4354	4353	4353	4354	4354	7.10
2298	4351	4350	4349	4349	4350	4351	7.02
2300	4347	4346	4345	4345	4346	4347	6.95
2302	4344	4343	4342	4342	4343	4344	6.87
2304	4340	4339	4338	4338	4339	4340	6.80
2306	4336	4335	4334	4334	4335	4336	6.72
2308	4332	4331	4330	4330	4331	4332	6.65
2310	4329	4328	4327	4327	4328	4329	6.58
2312	4325	4324	4323	4323	4324	4325	6.50
2314	4321	4320	4319	4319	4320	4321	6.42
2316	4317	4316	4315	4315	4316	4317	6.35
2318	4314	4313	4312	4312	4313	4314	6.27
2319	4311	4310	4309	4309	4310	4311	6.20
2320	4307	4306	4305	4305	4306	4307	6.13
2321	4304	4303	4302	4302	4303	4304	6.06
2322	4301	4300	4299	4299	4300	4301	5.99
2323	4298	4297	4296	4296	4297	4298	5.92
2324	4295	4294	4293	4293	4294	4295	5.85
2325	4292	4291	4290	4290	4291	4292	5.78
2326	4289	4288	4287	4287	4288	4289	5.71
2327	4286	4285	4284	4284	4285	4286	5.64
2328	4283	4282	4281	4281	4282	4283	5.57
2329	4280	4279	4278	4278	4279	4280	5.50
2330	4277	4276	4275	4275	4276	4277	5.43
2331	4274	4273	4272	4272	4273	4274	5.36
2332	4271	4270	4269	4269	4270	4271	5.29
2333	4268	4267	4266	4266	4267	4268	5.22
2334	4265	4264	4263	4263	4264	4265	5.15
2335	4262	4261	4260	4260	4261	4262	5.08
2336	4259	4258	4257	4257	4258	4259	5.01
2337	4256	4255	4254	4254	4255	4256	4.94
2338	4253	4252	4251	4251	4252	4253	4.87
2339	4250	4249	4248	4248	4249	4250	4.80
2340	4247	4246	4245	4245	4246	4247	4.73
2341	4244	4243	4242	4242	4243	4244	4.66
2342	4241	4240	4239	4239	4240	4241	4.59
2343	4238	4237	4236	4236	4237	4238	4.52
2344	4235	4234	4233	4233	4234	4235	4.45
2345	4232	4231	4230	4230	4231	4232	4.38
2346	4229	4228	4227	4227	4228	4229	4.31
2347	4226	4225	4224	4224	4225	4226	4.24
2348	4223	4222	4221	4221	4222	4223	4.17
2349	4220	4219	4218	4218	4219	4220	4.10
2350	4217	4216	4215	4215	4216	4217	4.03
2351	4214	4213	4212	4212	4213	4214	3.96
2352	4211	4210	4209	4209	4210	4211	3.89
2353	4208	4207	4206	4206	4207	4208	3.82
2354	4205	4204	4203	4203	4204	4205	3.75
2355	4202	4201	4200	4200	4201	4202	3.68
2356	4199	4198	4197	4197	4198	4199	3.61
2357	4196	4195	4194	4194	4195	4196	3.54
2358	4193	4192	4191	4191	4192	4193	3.47
2359	4190	4189	4188	4188	4189	4190	3.40
2360	4187	4186	4185	4185	4186	4187	3.33
2361	4184	4183	4182	4182	4183	4184	3.26
2362	4181	4180	4179	4179	4180	4181	3.19
2363	4178	4177	4176	4176	4177	4178	3.12
2364	4175	4174	4173	4173	4174	4175	3.05
2365	4172	4171	4170	4170	4171	4172	2.98
2366	4169	4168	4167	4167	4168	4169	2.91
2367	4166	4165	4164	4164	4165	4166	2.84
2368	4163	4162	4161	4161	4162	4163	2.77
2369	4160	4159	4158	4158	4159	4160	2.70
2370	4157	4156	4155	4155	4156	4157	2.63
2371	4154	4153	4152	4152	4153	4154	2.56
2372	4151	4150	4149	4149	4150	4151	2.49
2373	4148	4147	4146	4146	4147	4148	2.42
2374	4145	4144	4143	4143	4144	4145	2.35
2375	4142	4141	4140	4140	4141	4142	2.28
2376	4139	4138	4137	4137	4138	4139	2.21
2377	4136	4135	4134	4134	4135	4136	2.14
2378	4133	4132	4131	4131	4132	4133	2.07
2379	4130	4129	4128	4128	4129	4130	2.00
2380	4127	4126	4125	4125	4126	4127	1.93
2381	4124	4123	4122	4122	4123	4124	1.86
2382	4121	4120	4119	4119	4120	4121	1.79
2383	4118	4117	4116	4116	4117	4118	1.72
2384	4115	4114	4113	4113	4114	4115	1.65
2385	4112	4111	4110	4110	4111	4112	1.58
2386	4109	4108	4107	4107	4108	4109	1.51
2387	4106	4105	4104	4104	4105	4106	1.44
2388	4103	4102	4101	4101	4102	4103	1.37
2389	4100	4099	4098	4098	4099	4100	1.30
2390	4097	4096	4095	4095	4096	4097	1.23
2391	4094	4093	4092	4092	4093	4094	1.16
2392	4091	4090	4089	4089	4090	4091	1.09
2393	4088	4087	4086	4086	4087	4088	1.02
2394	4085	4084	4083	4083	4084	4085	0.95
2395	4082	4081	4080	4080	4081	4082	0.88
2396	4079	4078	4077	4077	4078	4079	0.81
2397	4076	4075	4074	4074	4075	4076	0.74
2398	4073	4072	4071	4071	4072	4073	0.67
2399	4070	4069	4068	4068	4069	4070	0.60
2400	4067	4066	4065	4065	4066	4067	0.53
2401	4064	4063	4062	4062	4063	4064	0.46
2402	4061	4060	4059	4059	4060	4061	0.39
2403	4058	4057	4056	4056	4057	4058	0.32
2404	4055	4054	4053	4053	4054	4055	0.25
2405	4052	4051	4050	4050	4051	4052	0.18
2406	4049	4048	4047	4047	4048	4049	0.11
2407	4046	4045	4044	4044	4045	4046	0.04
2408	4043	4042	4041	4041	4042	4043	0.00
2409	4040	4039	4038	4038	4039	4040	0.00
2410	4037	4036	4035	4035	4036	4037	0.00
2411	4034	4033	4032	4032	4033	4034	0.00
2412	4031	4030	4029	4029	4030	4031	0.00
2413	4028	4027	4026	4026	4027	4028	0.00
2414	4025	4024	4023	4023	4024	4025	0.00
2415	4022	4021	4020	4020	4021	4022	0.00
2416	4019	4018	4017	4017	4018	4019	0.00
2417	4016	4015	4014	4014	4015	4016	0.00
2418	4013	4012	4011	4011	4012	4013	0.00
2419	4010	4009	4008	4008	4009	4010	0.00
2420	4007	4006	4005	4005	4006	4007	0.00
2421	4004	4003	4002	4002	4003	4004	0.00
2422	4001	4000	3999	3999	4000	4001	0.00
2423	3998	3997	3996	3996	3997	3998	0.00
2424	3995	3994	3993	3993	3994	3995	0.00
2425	3992	3991	3990	3990	3991	3992	0.00
2426	3989	3988	3987	3987	3988	3989	0.00
2427	3986	3985	3984	3984	3985	3986	0.00
2428	3983	3982	3981	3981	3982	3983	0.00
2429	3980	3979	3978	3978	3979	3980	0.00
2430	3977	3976	3975	3975	3976	3977	0.00
2431	3974	3973	3972	3972	3973	3974	0.00
2432	3971	3970	3969	3969	3970	3971	0.00
2433	3968	3967	3966	3966	3967	3968	0.00
2434	3965	3964	3963	3963	3964	3965	0.00
2435	3962	3961	3960	3960	3961	3962	0.00
2436	3959	3958	3957	3957	3958	3959	0.00
2437	3956	3955	3954	3954	3955	3956	0.00
2438	3953	3952	3951	3951	3952	3953	0.00
2439	3950	3949	3948	3948	3949	3950	0.00
2440	3947	3946	3945	3945	3946	3947	0.00
2441	3944	3943	3942	3942	3943	3944	0.00
2442	3941	3940	3939	3939	3940	3941	0.00
2443	3938	3937	3936	3936	3937	3938	0.00
2444	3935	3934	3933	3933	3934	3935	0.00
2445	3932	3931	3930	3930	3931	3932	0.00
2446	3929	3928	3927	3927	3928	3929	0.00
2447	3926	3925	3924	3924	3925	3926	0.00
2448	3923	3922	3921	3921	3922	3923	0.00
2449	3920	3919	3918	3918	3919	3920	0.00
2450	3917	3916	3915	3915	3916	3917	0.00
2451	3914	3913	3912	3912	3913	3914	0.00
2452	3911	3910	3909	3909	3910	3911	0.00
2453	3908	3907	3906	3906	3907	3908	0.00
2454	3905	3904	3903	3903	3904	3905	0.00
2455	3902	3901	3900	3900	3901	3902	0.00
2456	3899	3898	3897	3897	3898	3899	0.00
2457	3896	3895	3894	3894	3895	3896	0.00
2458	3893	3892	3891	3891	3892	3893	0.00
2459	3890	3889	3888	3888	3889	3890	0.00
2460	3887	3886	3885	3885	3886	3887	0.00
2461	3884	3883	3882	3882	3883	3884	0.00
2462	3881	3880	3879	3879	3880	3881	0.00
2463	3878	3877	3876	3876	3877	3878	0.00
2464	3875	387					

2320	4310	6.22	4309	6.21	4309	6.20	4308	6.19	4308	6.18	4308	6.17	4307	6.16	4307	6.15
2322	4306	6.14	4306	6.13	4305	6.12	4304	6.11	4304	6.10	4304	6.09	4303	6.08	4303	6.08
2324	4302	6.07	4302	6.06	4302	6.05	4301	6.04	4301	6.03	4300	6.02	4299	6.01	4299	6.00
2326	4299	5.99	4298	5.98	4298	5.97	4297	5.96	4297	5.95	4296	5.94	4295	5.93	4295	5.92
2328	4295	5.91	4295	5.90	4294	5.89	4294	5.88	4293	5.88	4293	5.87	4292	5.86	4292	5.85
2330	4291	5.84	4291	5.83	4290	5.82	4290	5.81	4290	5.80	4289	5.79	4289	5.78	4288	5.77
2332	4288	5.76	4287	5.75	4287	5.74	4286	5.73	4286	5.72	4285	5.71	4285	5.70	4284	5.69
2334	4284	5.68	4284	5.67	4283	5.66	4283	5.65	4282	5.65	4282	5.64	4281	5.63	4281	5.62
2336	4280	5.61	4279	5.60	4279	5.59	4279	5.58	4278	5.57	4278	5.56	4278	5.55	4277	5.54
2338	4277	5.53	4276	5.52	4276	5.51	4275	5.50	4275	5.49	4274	5.48	4274	5.47	4273	5.46
2340	4273	5.45	4272	5.44	4272	5.43	4272	5.42	4271	5.41	4271	5.40	4270	5.40	4270	5.39
2342	4269	5.38	4269	5.37	4268	5.36	4268	5.35	4268	5.34	4267	5.33	4267	5.32	4266	5.31
2344	4266	5.30	4265	5.29	4265	5.28	4264	5.27	4264	5.26	4263	5.25	4263	5.24	4263	5.23
2346	4262	5.22	4262	5.21	4261	5.20	4261	5.19	4260	5.18	4260	5.17	4259	5.16	4259	5.15
2348	4258	5.14	4258	5.13	4258	5.12	4257	5.11	4257	5.10	4256	5.09	4256	5.09	4255	5.08

2350	4255	4254	5.06	4254	5.06	4254	5.05	4258	5.04	4253	5.03	4258	5.02	4258	5.01	4252	5.00
2352	4251	4251	4.99	4251	4.99	4250	4.97	4250	4.96	4250	4.95	4249	4.94	4248	4.93	4248	4.92
2354	4248	4247	4.90	4247	4.89	4246	4.88	4246	4.87	4245	4.86	4245	4.85	4244	4.84	4244	4.83
2356	4244	4244	4.82	4243	4.81	4243	4.80	4242	4.79	4242	4.78	4241	4.77	4241	4.76	4241	4.75
2358	4240	4239	4.74	4239	4.73	4239	4.72	4239	4.71	4238	4.70	4238	4.69	4237	4.68	4237	4.67
2360	4237	4236	4.67	4236	4.66	4235	4.65	4235	4.64	4235	4.63	4234	4.62	4234	4.61	4234	4.60
2362	4233	4233	4.59	4232	4.58	4232	4.57	4231	4.56	4231	4.55	4231	4.54	4230	4.53	4230	4.52
2364	4230	4229	4.51	4229	4.50	4228	4.49	4228	4.48	4227	4.47	4227	4.46	4226	4.45	4226	4.44
2366	4226	4226	4.43	4225	4.42	4225	4.41	4224	4.40	4224	4.39	4223	4.38	4223	4.37	4223	4.36
2368	4222	4222	4.35	4222	4.34	4221	4.33	4221	4.32	4220	4.31	4220	4.30	4219	4.29	4219	4.28
2370	4219	4218	4.27	4218	4.26	4218	4.25	4217	4.24	4217	4.23	4216	4.22	4216	4.21	4216	4.20
2372	4215	4215	4.19	4214	4.18	4214	4.17	4214	4.16	4213	4.15	4213	4.14	4212	4.13	4212	4.12
2374	4212	4211	4.11	4211	4.10	4210	4.09	4210	4.08	4209	4.07	4209	4.06	4209	4.05	4209	4.04
2376	4208	4208	4.03	4207	4.02	4207	4.01	4206	4.00	4206	3.99	4206	3.98	4205	3.97	4205	3.96
2378	4205	4204	3.95	4204	3.94	4203	3.93	4203	3.92	4203	3.91	4202	3.90	4202	3.89	4202	3.88

2380	4201	4201	4200	4200	4200	4200	4200	2381
3.88	3.87	3.86	3.85	3.84	3.83	3.82	3.81	4199
4198	4197	4196	4196	4196	4195	4195	4195	4199
3.80	3.79	3.78	3.77	3.76	3.75	3.74	3.73	4195
2382	4198	4197	4196	4196	4195	4195	4195	4199
2382	4198	4197	4196	4196	4195	4195	4195	4199
2384	4194	4193	4193	4192	4192	4191	4191	4199
3.72	3.71	3.70	3.69	3.68	3.67	3.66	3.65	4191
2386	4190	4189	4189	4189	4188	4188	4188	4191
3.64	3.63	3.62	3.61	3.60	3.59	3.58	3.57	4188
2388	4187	4186	4186	4185	4185	4184	4184	4188
3.56	3.55	3.54	3.53	3.52	3.51	3.50	3.49	4184
2390	4183	4183	4182	4182	4181	4181	4181	4188
3.48	3.47	3.46	3.45	3.44	3.43	3.42	3.41	4181
2392	4180	4179	4179	4178	4178	4177	4177	4181
3.40	3.39	3.38	3.37	3.36	3.35	3.34	3.33	4177
2394	4176	4176	4175	4175	4174	4174	4174	4177
3.32	3.31	3.30	3.29	3.28	3.27	3.26	3.25	4174
2396	4173	4172	4172	4171	4171	4171	4170	4177
3.24	3.23	3.22	3.21	3.20	3.19	3.18	3.17	4171
2398	4170	4169	4168	4168	4167	4167	4167	4171
3.16	3.15	3.14	3.13	3.12	3.11	3.10	3.09	4167
2400	4166	4165	4165	4164	4164	4164	4163	4167
3.08	3.07	3.06	3.05	3.04	3.03	3.02	3.01	4164
2402	4163	4162	4161	4161	4161	4160	4160	4164
3.00	2.98	2.97	2.96	2.95	2.94	2.93	2.92	4160
2404	4159	4158	4158	4158	4157	4157	4156	4160
2.91	2.90	2.89	2.88	2.87	2.86	2.85	2.84	4157
2406	4156	4155	4154	4154	4154	4153	4153	4157
2.83	2.82	2.81	2.80	2.79	2.78	2.77	2.76	4153
2408	4152	4151	4151	4151	4150	4150	4149	4153
2.75	2.74	2.73	2.72	2.71	2.70	2.69	2.68	4150

2440	4098	1°42	4097	1°41	4097	1°40	4097	1°39	2441
2442	4095	1°34	4094	1°33	4094	1°32	4093	1°31	2443
2444	4091	1°25	4091	1°24	4090	1°23	4090	1°22	2445
2446	4088	1°17	4087	1°16	4087	1°15	4087	1°14	2447
2448	4084	1°08	4084	1°07	4084	1°06	4083	1°05	2449
2450	4081	1°00	4081	°99	4080	°98	4080	°97	2451
2452	4078	°92	4077	°90	4077	°89	4076	°88	2453
2454	4074	°83	4074	°82	4074	°81	4073	°80	2455
2456	4071	°74	4071	°73	4070	°72	4070	°71	2457
2458	4068	°66	4067	°65	4067	°64	4066	°63	2459
2460	4065	°57	4064	°56	4064	°55	4063	°54	2461
2462	4061	°49	4061	°48	4060	°47	4060	°46	2463
2464	4058	°40	4058	°39	4057	°38	4056	°36	2465
2466	4055	°32	4054	°31	4054	°30	4053	°28	2467
2468	4051	°23	4051	°22	4051	°21	4050	°20	2469
4048	4048	°16	4049	°17	4049	°18	4049	°19	4050

2470	4048	.14	2472	4045	.06
4048	4048	.13	4044	4044	.05
4047	4047	.12	4044	4044	.04
4047	4047	.11	4044	4044	.03
2471	4046	.10	2473	4043	.02
4046	4046	.09	4043	4043	.00
4046	4045	.08			
4045	4045	.07			

THE RELIABILITY OF USU TELEMETERED

PRECIPITATION DATA--1

The Counter Precision Factor for 8" x 36" Gages

Appendix B

The Fortran 200 Program for Relating Electromagnetic

Frequencies and Periods to Inches of Precipitation for the 8" x

36" Gage.

001	FUNCTION	RTWGR(F0*RT1*P2*RT3*RT4)*RT5*RT6
002	A1=(P0-P2)*RT1/(P1-P2)*P1-P3	
003	A2=(P0-P1)*RT2*RT3/(P2-P1)*P2-P3	
004	A3=(P0-P1)*RT4*RT5/(P3-P1)*P3-P2	
005	RTAQR=V1*RT1*V3	
006	REIDNN	
007	END	

FORTRAN 200 2001 11/11/11 11/11/11 11/11/11