Measurement of Leaf Area of
Mulberry Trees

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桑樹 葉面積의 簡易測定法

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摘 要

桑樹의 葉面積은 桑葉의 收穫量 即 收量과 높은 相關關係가 있고 그의 簡易測定法은 매우 意義깊은 일이므로 桑田에서 生體대로 葉面積을 測定할수 있도록 簡易測定法을 考案하였다.

우리나라 桑樹의 主要品種인 改良鼠返, 一之瀨, 魯桑 그리고 水原桑 4號의 4個品種을 材料로 節位別로, 枝條別로 葉面積과 葉長, 最大葉幅과의 關係를 調査 實驗하였으며 供試 葉數는 改良鼠返 741枚, 一之瀨 853枚, 魯桑 507枚, 水原桑4號 441枚, 都合 2,542枚이었다. 5個裂葉으로 葉形이 비슷한 改良鼠返과 一之瀨의 2個品種의 葉面積은(葉長×最大葉幅)×0.643, 單葉인 魯桑과 水原桑4號의 2個品種의 葉面積은(葉長×最大葉幅)×0.735에 依해서 求할수 있음을 알았다.

即 改良鼠返과 一之瀨는 葉長에 最大葉幅을 곱한 積에 係數 0.634를 곱함으로써 全處理葉에서 planimeter에 依한 葉面積과 높은 相關關係를 보였고 이때의 相關係數의 平均을 改良鼠返에 있어서는 r=0.931, 一之瀨에 있어서는 r=0.960이다.

魯桑과 水原桑 4號는 葉長에 最大葉幅을 곱한 積에 係數 0.735를 곱함으로써 全處理葉에서 planimeter에 依한 葉面積과 또한 높은 相關關係를 보였고 이때의 相關係數 r의 平均을 魯桑에 있어서는 r=0.999, 水原桑4號에 있어서는 r=0.996 이었다.

이 方法에 依하면 時間과 努力을 크게 節減시킬수 있을 뿐만 아니라 生體대로 쉽게 葉面積을 求할 수 있는 利點이 있다.

Introduction

The importance of leaf area as related to transpiration and photosynthesis is generally recognized. In general, the leaves of mulberry trees consist of different types of the single leaves, 3-5 lobted leavesand a single form of leaves from each node of the stem. Two leading varieties of mulberry trees, Gaeryang Souban and Ilchirye have 3-5 lobted leaves, and two other leading varieties of mulberry trees, used as the materials, Nosang and Suwon Sang No. 4, have the single round leaves. These leaves consist of one leaf from each node of the stem.

Three methods of measuring area of strawberry leaves were used by Darrow. (1932) The first involved determining a factor to be used with length or length width measurements. The second method involved placing leaves on pieces of cardboard of known area cut to the shape of the leaves. Direct use of the

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planimeter on intact leaves was Darrows' third method. Miller (1938) [8] enumerated several methods to determine the leaf surface area in plants, some of which were extremely laborious and required removing leaves from plants. They included tracing outlines of leaves on paper and measuring the enclosed area with a planimeter or cutting out the traced areas and comparing the weights obtained with the weight of a known paper Another involved placing the form of the leaf on sensitized paper with the area being determined by measuring or weighting as above Miller further stated that the photoelectric cell can also be utilized to estimate leaf area.

Working with field beans, Davis (1940) [4] found that 0.004517 (length×width) of the center leaflet was the most nearly accurate of four methods attempted. A single procedure to measure leaf area in corn was devised by Montgomery (1911) [7] and used by Kiesselbach (1950) [5] The formula for determination of Corn leaf area was length×width×0.75. Stickler et al. (1961) [8] have successfully used length times width ×0.747 to estimate area of grain sorghum leaves. Bhan and Pande (1966) [1] has used length×width ×0.802 to determine leaf area of rice varieties.

Chang (1968) [2] used 0.658 (length×maximum width) to determine main leaflet area of soybean varieties.

The main objectives of the present investigation were to develop an accurate, rapid method to determine leaf area in mulberry trees and to examine certain data associated with leaf area determinations.

Experimental Procedures and Results

To develop a simple formula to estimate leaf area, randomly selected 741 leaves from 15 branches of Gaeryang Souban, 853 leaves from 15 branches of Ilchirye, 507 leaves from 15 branches of Nosang, 441 leaves from 15 branches of Suwonsang no. 4, which are all Korean mulberry trees of the leading varieties, were removed from the plants at Chinju Sericultural Branch Station, Chinju, Korea.

Mulberry trees used as the materials were planted in 1961, and those four varieties were grown under the common level of fertilization (N:25 Kg, P_2O_5:11 Kg, K2O:17 Kg 10a) in 6 feet row and 2.5 feet apart and the leaves were detached on 6 th, September, 1968

After sampling, the outline of each leaf was immediately traced on plain white paper. The maximum width and length were also determined. Each leaf tracing was then measured with a planimeter and the area recorded. The relationship between leaf area obtained by the planimeter and leaf area obtained as product of leaf length times maximum leaf width was found by using equation $Y=aX$, where Y (leaf area obtained by planimeter) and X (leaf area as the product of leaf length times maximum leaf width) are the means of their respective populations. Values of the constant "a" were calculated under different nodes from different branches, and varieties.

They are given in table 1.

Average value of constant "a" of two lobbed leaf varieties is 0.634, and that of two normal leaf varieties is 0.735.

All correlation coeffient "r" values are significant at the 1% level, respectively.

The average planimeter leaf area of two lobbed leaf varieties, Gaeryang Souban and Ilchirye, was 0.634 length maximum width as shown in table 1, and the average planimeter leaf area of two normal leaf varieties, Nosang and Suwon Sang No. 4, was 0.735×length×maximum width of leaves, respectively.

The relationships between leaf area obtained by the planimeter and leaf area obtained as a product leaf length times maximum width multiplied by constants, 0.634 or 0.735, gave the strong correlations

Table 1. Average values of constant "a" and correlation coefficients "r" at leaves from different branches and varieties of mulberry trees

Branch	Lobbed leaf varieties				Normal leaf varieties			
	Gaeryang Souban		Ilchirye		Nosang		Suwon Sang No. 4	
no.	leaf no.	"a"	leaf no.	"a"	leaf no.	"a"	leaf no.	"a"
1	46	0.6315	58	0 6340	32	0 7252	28	0.7424
2	30	0.6265	62	0.6383	32	0.7338	33	0.7384
3	45	0.6305	60	0.6570	24	0.7460	29	0.7547
4	41	0.6527	64	0.6515	30	0.7386	36	0.7431
5	46	0.6453	52	0.6191	34	0.7178	27	0.7449
6	51	0.6345	52	0.6533	32	0.7252	28	0.7677
7	57	0.6071	68	0.6310	30	0.7695	30	0.7398
8	53	0.6089	56	0.6262	33	0.7767	35	0.7372
9	51	0.6121	57	0.6412	41	0.7811	26	0.7420
10	55	0.6214	46	0.6270	37	0.7215	27	0.7150
11	60	0.6344	51	0.6308	44	0.7244	25	0.7216
12	57	0.6223	58	0.6406	20	0.7254	30	0.7242
13	58	0.6532	42	0.6360	41	0.7146	34	0.7479
14	47	0.6310	69	0.6525	35	0.7255	29	0.7229
15	44	0.6243	58	0.6420	42	0.7341	24	0.7348
Average			0.634				0.735	
Total "r"	741		855		507		441	
		r=0.931		r=0.960	r=0.999		r=996	

in different varieties.

All correlation coefficients, 0.931, 0.960, 0.999, and 0.996, are significant at the 1% level in each varietal basis, respectively.

It can be concluded from the studies that lobbed leaf area of mulberry tree varieties, Gaeryang Souban and Ilchirye, can be estimated as a product of leaf length times maximum width multiplied by 0.634, and normal leaf area of mulberry tree varieties, Nosang and Suwon Sang 4, can also be estimated as a product of leaf length times maximum width multipiled by 0.735.

Appendix I showed the leaf area of mulberry trees by (leaf length× maximum leaf width)×0.634 in the lobbed leaf varieties, Gaeryang Souban and Ilchirye.

Appendix II showed the leaf area of mulberry trees by (leaf length×maximum leaf width)×0.735 in the normal leaf varieties, Nosang and Suwon Sang No.4.

This will give a leaf area very near to that obtained by the planimeter, in addition to saving time and labor, and this method will be useful in measuring leaf area without destroying the leaf

SUMMARY

Maximum length× maximum width× 0.634 was found to be accurate and reliable method of extimating the lobbed leaf area in two varieties of mulberry trees, which are 3-5 lobbed leaf varieties. Maximum length ×maximum width ×0.735 was also found to be accurate and reliable method of estimating the no-

rmal leaf area in two varietis, which have the simple normal leaves, of mulberry trees. Those areas obtained as a product of leaf length times width multiplied by constant "a" gave a strong correlation with the leaf area taken by planimeter under all conditions. This method will be useful in measuring leaf area without destroying the leaf, and, in addition to saving time and labor.

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Appendix I. Measurement of leaf area of Mulberry tree by(leaf length× maximum leaf wi
-dth)×0.634 in the lobbed leaf Varieties:Gaeryang Souban and Ilchirye (cm²)

width / Length	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0.1	0.006	0.013	0.019	0.025	0.032	0.038	0.044	0.051	0.057	0.063
0.2	0.013	0.025	0.038	0.051	0.063	0.076	0.089	0.101	0.114	0.126
0.3	0.019	0.038	0.057	0.076	0.095	0.114	0.133	0.152	0.171	0.190
0.4	0.025	0.051	0.076	0.101	0.127	0.152	0.178	0.203	0.228	0.254
0.5	0.032	0.063	0.095	0.127	0.159	0.190	0.222	0.254	0.285	0.317
0.6	0.038	0.076	0.114	0.152	0.190	0.228	0.266	0.304	0.342	0.380
0.7	0.044	0.089	0.133	0.178	0.222	0.266	0.311	0.355	0.399	0.444
0.8	0.051	0.101	0.152	0.203	0.254	0.304	0.355	0.406	0.456	0.507
0.9	0.057	0.114	0.171	0.228	0.285	0.342	0.399	0.456	0.514	0.571
1.0	0.063	0.127	0.190	0.254	0.317	0.380	0.444	0.507	0.571	0.634
2.0	0.127	0.254	0.380	0.507	0.634	0.761	0.888	1.014	1.141	1.268
3.0	0.190	0.380	0.571	0.761	0.951	1.141	1.331	1.522	1.712	1.902
4.0	0.254	0.507	0.761	1.014	1.268	1.522	1.775	2.029	2.282	2.536
5.0	0.317	0.634	0.951	1.268	1.585	1.902	2.219	2.536	2.853	3.170
6.0	0.380	0.761	1.141	1.522	1.902	2.282	2.663	3.043	3.442	3.804
7.0	0.444	0.888	1.331	1.775	2.219	2.663	3.107	3.550	3.994	4.438
8.0	0.507	1.014	1.522	2.029	2.536	3.042	3.550	4.057	4.564	5.072
9.0	0.571	1.141	1.712	2.282	2.853	3.424	3.994	4.565	5.135	5.706
10.0	6.634	1.268	1.902	2.536	3.170	3.804	4.438	5.072	5.706	6.340
11.0	0.697	1.395	2.092	2.790	3.487	4.184	4.882	5.579	6.277	6.974
12.0	0.761	1.522	2.282	3.043	3.804	4.565	5.326	6.086	6.847	7.608
13.0	0.824	1.648	2.473	3.297	4.121	4.945	5.769	6.594	7.418	8.242
14.0	0.888	1.775	2.663	3.550	4.438	5.326	6.213	7.101	7.988	8.876
15.0	0.951	1.902	2.853	3.804	4.755	5.706	6.657	7.608	8.559	9.510
16.0	1.014	2.029	3.043	4.058	5.072	6.086	7.101	8.115	9.130	10.144
17.0	1.078	2.156	3.233	4.311	5.389	6.467	7.545	8.622	9.700	10.778
18.0	1.141	2.282	3.424	4.565	5.706	6.842	7.988	9.129	10.271	11.412
19.0	1.205	2.409	3.614	4.818	6.023	7.228	8.432	9.637	10.841	12.046
20.0	1.268	2.536	3.804	5.072	6.340	7.608	8.876	10.144	11.412	12.680
21.0	1.331	2.663	3.994	5.326	6.657	7.988	9.320	10.657	11.983	13.314
22.0	1.395	2.790	4.184	5.579	6.974	8.369	9.764	11.158	12.553	13.948
23.0	1.458	2.916	4.375	5.833	7.291	8.749	10.207	11.665	13.124	14.582
24.0	1.522	3.043	4.565	6.086	7.608	9.130	10.651	12.173	13.694	15.216
25.0	1.585	3.170	4.755	6.340	7.925	9.510	11.095	12.680	14.265	15.850
26.0	1.648	3.297	4.945	6.594	8.242	9.890	11.539	13.187	14.836	16.484
27.0	1.712	3.424	5.135	6.847	8.559	10.271	11.983	13.694	15.406	17.118
28.0	1.775	3.550	5.326	7.101	8.876	10.651	12.651	12.426	14.202	17.759
29.0	1.839	3.677	5.516	7.354	9.193	11.031	12.870	14.709	16.547	18.386
30.0	1.902	3.804	5.703	7.608	9.510	11.412	13.314	15.216	17.118	19.020

2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	20.0	30.0
1.127	0.190	0.254	0.317	0.380	0.444	0.507	0.571	6.340	1.268	1.902
0.254	0.380	0.507	0.634	0.761	0.888	1.014	1.141	1.268	2.536	3.804
0.380	0.571	0.761	0.951	1.141	1.331	1.522	1.712	1.902	3.804	5.706
0.507	0.761	1.014	1.268	1.522	1.775	2.029	2.282	2.536	5.072	7.608
0.634	0.951	1.268	1.585	1.902	2.219	2.539	2.853	3.170	6.340	9.510
0.761	1.141	1.522	1.902	2.282	2.663	3.043	3.424	3.804	7.608	11.412
0.888	1.331	1.775	2.219	2.663	3.107	3.550	3.994	4.438	8.876	13.314
1.014	1.522	2.029	2.536	3.043	3.550	4.058	4.565	5.072	10.144	15.216
1.141	1.721	2.282	2.853	3.424	3.994	4.565	5.135	5.706	11.412	17.118
1.2o8	1.902	2.536	3.170	3.804	4.438	5.072	5.706	6.340	12.680	19.020
2.536	3.804	5.072	6.340	7.608	8.876	10.144	11.412	12.680	25.360	38.040
3.804	5.706	7.608	9.510	11.412	13.314	15.216	17.118	19.020	38.040	57.060
5.072	7.608	10.144	12.680	15.216	17.752	20.288	22.824	25.360	50.720	76.080
6.430	9.510	12.680	15.850	19.020	22.190	25.360	28.530	31.700	63.400	90.100
7.608	11.412	15.216	19.020	22.824	26.628	30.432	34.236	38.040	76.080	114.120
8.876	13.314	17.752	22.190	26.628	31.066	35.504	39.942	44.380	88.760	133.140
10.144	15.216	20.288	25.360	30.432	35.504	40.576	45.576	45.648	50.720	101.440
11.412	17.118	22.824	28.530	34.236	39.942	45.648	51.354	57.060	114.120	171.180
12.680	19.020	25.360	31.700	38.040	44.380	50.720	57.060	63.400	126.800	190.200
13.948	20.922	27.896	34.870	41.844	48.818	55.792	62.766	69.740	139.480	209.220
15.216	22.824	30.432	38.040	45.648	53.256	60.864	68.472	76.080	152.160	228.240
16.484	24.726	32.968	41.210	49.452	57.694	65.936	74.178	82.420	164.840	247.260
17.752	26.628	35.504	44.380	53.256	62.13?	71.088	79.884	88.760	177.520	266.280
19.020	28.530	38.040	47.550	57.060	66.570	76.080	85.590	95.100	190.200	285.300
20.288	30.432	40.576	50.720	60.864	71.008	81.152	91.296	101.440	202.880	304.320
21.555	33.342	43.112	53.890	64.668	75.446	86.224	97.002	107.780	215.560	323.340
22.824	34.236	45.648	57.060	68.472	79.884	91.296	102.708	114.120	228.240	342.360
24.092	36.138	48.184	60.230	72.276	84.322	96.369	108.414	120.460	240.920	361.380
25.360	38.040	50.720	36.400	76.080	88.760	101.440	114.120	126.800	253.600	380.400
26.628	39.942	53.256	66.570	79.884	93.198	106.512	119.826	133.140	266.280	399.420
27.896	41.844	55.792	69.740	83.688	97.636	111.584	125.532	139.480	278.960	418.440
29.164	43.746	58.328	72.910	87.492	102.074	116.656	131.238	145.820	291.640	437.460
30.432	45.648	60.864	76.080	91.296	106.512	121.728	136.944	152.160	304.320	456.480
31.700	47.550	63.400	79.250	95.100	110.950	126.800	142.650	158.500	317.000	475.500
32.968	49.452	65.936	81.420	98.904	115.388	131.872	148.356	164.840	329.680	494.520
34.236	51.354	68.472	85.590	102.708	119.826	136.944	154.062	171.180	342.360	513.540
35.504	53.256	71.008	88.760	106.512	124.264	142.016	159.768	177.520	355.040	532.560
36.772	55.158	73.544	91.930	110.316	128.702	147.088	156.474	183.860	367.720	551.580
38.045	57.060	76.080	95.100	114.120	133.140	512.160	171.180	190.200	380.400	570.600

Length \ width	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0
0.1	0.007	0.015	0.022	0.029	0.037	0.044	0.051	0.059	0.066	0.074
0.2	0.075	0.029	0.044	0.059	0.074	0.088	0.103	0.118	0.132	0.147
0.3	0.022	0.044	0.066	0.088	0.110	0.132	0.534	0.176	0.198	0.221
0.4	0.029	0.059	0.088	0.118	0.147	0.176	0.206	0.235	0.265	0.264
0.5	0.037	0.074	0.110	0.147	0.184	0.221	0.257	0.294	0.331	0.368
0.6	0.044	0.088	0.132	0.176	0.221	0.265	0.309	0.353	0.397	0.441
0.7	0.051	0.103	0.154	0.209	0.257	0.309	0.360	0.412	0.463	0.915
0.8	0.059	0.118	0.176	0.235	08294	0.353	0.412	0.470	0.529	0.583
0.9	0.066	0.132	0.198	0.265	0.331	0.397	0.463	0.529	0.595	0.662
1.0	0.474	0.147	0.221	0.294	0.367	0.441	0.515	0.588	0.662	0.735
2.0	0.147	0.294	0.441	0.588	0.735	0.882	1.029	1.176	1.323	1.470
3.0	0.221	0.441	0.662	0.882	1.103	1.323	1.543	1.764	1.985	2.205
4.0	0.229	0.588	0.882	1.176	1.470	1.764	2.058	2.352	2.646	2.140
5.0	0.368	0.735	1.103	1.470	1.838	2.205	2.573	2.940	3.308	3.675
6.0	0.441	0.882	1.323	1.764	2.205	2.646	3.087	3.528	3.969	4.410
7.0	0.515	1.029	1.544	2.058	2.563	3.087	3.602	4.116	4.116	4.631
8.0	0.588	1.176	1.764	2.352	2.940	3.528	4.116	4.704	5.292	5.880
9.0	0.662	1.323	1.985	2.646	3.308	3.969	4.631	5.292	5.954	6.615
10.0	0.735	1.470	2.205	2.940	3.675	4.410	5.145	5.880	6.615	7.530
11.0	0.809	1.617	2.426	3.324	4.043	4.851	5.660	6.468	7.277	8.085
12.0	0.882	1.764	2.646	3.528	4.410	5.292	6.174	7.056	7.938	8.820
13.0	0.956	1.911	2.867	3.822	4.778	5.733	6.689	7.644	8.600	9.555
14.0	1.029	2.058	3.587	4.116	5.145	6.174	7.203	8.232	6.261	10.290
15.0	1.103	2.205	3.308	4.410	5.523	6.615	7.718	8.820	9.923	11.025
16.0	1.176	2.352	3.528	4.704	5.880	7.056	8.232	9.408	10.584	11.760
17.0	1.250	2.499	3.749	4.998	6.482	7.497	8.747	9.996	11.246	12.495
18.0	1.323	2.646	3.969	5.292	6.615	7.938	9.261	10.584	11.907	13.230
19.0	1.397	2.793	4.190	5.586	6.983	8.379	9.776	11.172	12.569	13.965
20.0	1.470	2.940	4.410	5.880	7.350	8.820	10.290	11.760	13.230	14.700
21.0	1.544	3.087	4.631	6.174	7.718	9.261	10.805	12.348	13.892	15.435
22.0	1.617	3.234	4.851	6.468	8.085	9.702	11.319	12.936	14.553	16.170
23.0	1.691	3.381	5.072	6.762	8.453	10.143	11.834	13.524	15.215	16.905
24.0	1.764	3.528	5.292	7.056	8.820	10.584	12.348	14.112	15.876	17.640
25.0	1.838	3.675	5.513	7.350	9.188	11.025	12.863	14.700	16.538	18.375
26.0	1.911	3.822	5.733	7.644	9.555	11.466	13.377	15.288	17.199	19.110
27.0	1.985	3.969	5.954	7.938	9.923	11.907	13.892	15.876	17.861	19.845
28.0	2.058	4.116	6.174	8.232	10.290	12.348	14.406	16.464	18.522	20.580
29.0	2.132	4.263	6.395	8.526	10.658	12.789	14.921	17.052	19.184	21.315
30.0	2.205	4.410	6.615	8.820	11.025	13.230	15.435	17.640	19.845	22.050
40.0	2.940	5.880	8.820	11.760	14.700	17.640	20.580	23.520	26.460	29.400

2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	20.0	30.0
0.147	0.221	0.294	0.368	0.441	0.515	0.588	0.662	0.735	1.470	2.205
0.294	0.441	0.588	0.775	0.882	1.029	1.176	1.323	1.470	2.940	4.410
0.441	0.662	0.882	1.103	1.323	1.544	1.764	1.985	2.205	4.410	6.615
0.588	0.882	1.176	1.470	1.764	2.058	2.352	2.646	2.940	5.880	8.820
0.735	1.103	1.470	1.838	2.205	2.573	2.940	3.308	3.675	7.350	11.025
0.882	1.323	1.764	2.205	2.646	3.087	3.528	3.969	4.410	8.820	13.230
1.029	1.544	2.058	2.573	3.087	3.632	4.116	4.631	5.145	10.290	15.435
1.176	1.764	2.352	2.940	9.528	4.116	4.704	5.292	5.880	11.760	17.640
1.323	1.985	2.646	3.308	3.969	4.631	5.292	5.954	6.615	13.230	19.845
1.470	2.205	2.940	3.675	4.410	5.145	5.880	6.615	7.350	14.700	22.050
2.940	4.410	5.890	7.350	8.820	10.290	11.760	13.230	14.700	29.400	44.100
4.410	6.615	8.820	11.025	13.230	15.435	17.640	19.845	22.050	44.100	66.150
5.890	8.820	11.760	14.700	17.640	20.530	23.530	26.460	29.400	58.800	88.200
7.350	11.025	14.700	18.375	22.050	25.725	23.400	33.057	36.570	73.500	110.250
8.820	13.230	17.640	22.050	26.460	30.870	35.280	39.690	44.100	88.200	132.300
10.260	15.435	20.580	25.725	30.870	36.015	41.160	46.305	51.450	102.900	154.350
11.760	17.640	23.520	29.400	35.280	41.160	47.040	52.920	58.800	117.600	176.400
13.230	19.845	26.460	33.075	39.690	46.305	52.920	59.535	66.150	132.300	198.450
14.700	22.050	29.400	36.750	44.100	51.450	58.800	66.150	73.500	147.000	220.500
16.170	24.255	32.340	40.425	48.510	56.595	64.680	72.765	80.850	161.700	242.550
17.640	26.460	35.280	44.100	52.920	61.740	70.560	79.380	88.200	176.400	264.600
19.110	28.665	38.220	47.775	57.330	66.885	76.440	85.995	95.550	191.100	286.650
20.580	30.870	41.160	51.450	61.740	72.030	82.320	92.610	102.900	205.800	308.700
22.050	33.075	44.100	55.125	65.150	77.175	88.200	99.225	110.250	220.500	330.750
23.520	35.280	47.040	58.800	70.560	82.320	94.090	105.840	117.600	235.200	352.800
24.990	37.485	49.980	62.475	74.970	87.465	99.960	112.455	124.950	249.900	374.850
26.460	39.690	52.920	65.150	79.380	92.610	105.840	119.070	132.300	264.600	396.900
27.930	41.895	55.860	69.825	83.790	97.755	111.720	125.685	139.650	279.300	418.950
29.400	44.100	58.800	73.500	88.200	102.900	117.600	132.300	147.000	294.000	441.000
30.870	46.303	61.740	77.175	92.610	103.045	123.480	138.915	154.350	308.700	463.050
32.340	48.510	64.680	80.850	97.020	113.190	129.360	145.530	161.705	323.400	485.100
33.810	50.715	67.620	84.525	101.430	118.335	135.240	152.145	169.050	338.100	507.150
35.280	52.920	70.560	88.200	105.840	123.480	141.120	158.760	176.400	352.800	529.200
36.750	55.125	73.500	91.875	110.250	128.620	147.000	165.375	183.750	367.500	551.250
38.220	57.330	76.440	95.550	114.660	133.770	152.880	171.990	191.100	382.200	573.300
39.690	59.535	79.380	99.225	119.070	138.915	158.760	178.605	198.450	396.900	595.350
41.160	61.740	82.320	102.900	123.480	144.060	154.640	185.220	205.800	411.600	617.400
42.630	63.945	85.260	106.575	127.890	149.205	170.052	191.835	213.150	426.300	639.450
44.100	66.150	88.200	110.250	132.300	154.350	176.400	198.450	220.500	441.000	661.500
58.800	88.200	117.600	147.000	176.400	205.800	235.200	264.600	294.000	588.000	882.000