International Meteor Organization

Determination of the limiting magnitude

The darker and more transparent the sky and the more sensitive your eyes, the more meteors you can see. To use your observations for scientific analyses, a quantitative characterization of these factors has to be established. The limiting magnitude (which is defined as being the magnitude of the faintest star near the zenith that the observer can detect using the slightly averted naked eye) defines both the condition of the sky's clarity and the quality of the observer's eyes. Please note, the limiting magnitude is an observer specific quantity. Do not be surprised if other observers at the same site obtain different limiting magnitudes to you. This is the rule, rather than the exception. Only record your own values! There are several methods for determining the limiting magnitude. We describe one which is favoured by many meteor observers.

In Table 1 a number of star fields are shown. The stars visible within these areas, including the corner stars, have to be counted. After the observation the number of stars can be converted into the limiting magnitude by using Table 2. Do not increase your attention artificially when obtaining the limiting magnitude since it should characterize your average eye-state during your observation. Determine the limiting magnitude at the start of the watch, and then every 30-45 minutes, even if there is no considerable change. In this way you will reduce the random errors in the procedure. You should preferentially use fields in your observing direction, and use at least two, or better three, fields for each determination. Again, doing this will help to reduce random errors. The fields should have an elevation of more than 40°. Remember to note the time, field number, and the number of stars counted. Fields near the Milky Way like Field 14 may cause systematically lower limiting magnitudes since the stars could not be resolved by your eyes. This effect was found for limiting magnitudes higher than 6.0 mag.

Field	Corner stars	Field in the Atlas Brno
1	chi Dra -- zeta Dra -- delta Dra -- xi Dra	Chart 3
2	beta Per -- delta Per -- zeta Per	Chart 1
3	23 UMa -- theta UMa -- beta UMa	Chart 2
4	alpha Gem -- epsilon Gem -- beta Gem	Chart 4
5	zeta Aql -- gamma Aql -- delta Aql	Chart 9
6	alpha And -- gamma Peg -- alpha Peg	Chart 6
7	alpha Cep -- beta Cep -- delta Cep	Chart 1
8	alpha Tau -- beta Tau -- zeta Tau	Chart 4
9	alpha Leo -- beta Leo -- gamma Leo -- delta Leo	Chart 8
10	alpha Vir -- zeta Vir -- gamma Vir	Chart 5
11	alpha CrB -- gamma Boo -- alpha Boo	Chart 5
12	alpha Ser -- beta Lib -- delta Oph	Chart 5
13	beta Lyr -- zeta Lyr -- theta Her -- nu Her	Chart 3
14	epsilon Cyg -- eta Cyg -- gamma Cyg	Chart 3
15	beta Dra -- tau Her -- pi Her	Chart 3
16	alpha CVn -- epsilon UMa -- eta UMa	Chart 2
17	epsilon Aur -- theta Aur -- delta Aur	Chart 1
18	mu And -- gamma And -- phi And	Chart 1
19	kappa Dra -- alpha Dra -- beta UMi	Chart 2
20	42 Cam -- beta Cam -- gamma Cam	Chart 1
21	alpha PsA -- 98 Aqr -- delta Aqr	Chart 6
22	beta Lep -- beta Ori -- 53 Eri	Chart 4
23	delta Crv -- gamma Crv -- epsilon Crv -- beta Crv	Chart 5
24	beta Lib -- gamma Lib -- sigma Lib -- alpha Lib	Chart 5
25	alpha Sco -- epsilon Sco -- chi Lup	Chart 9
26	gamma TrA -- alpha TrA -- eta Ara -- alpha Cen	

27 beta Cen -- alpha Cru -- gamma Cru
28 beta Car -- epsilon Car -- iota Car
29 gamma Hyd -- alpha Hyd -- beta Hyd
30 alpha Tuc -- alpha Pav -- epsilon Pav

Table 2. Conversion table for all 30 limiting-magnitude areas.

The number of stars (N) seen in one of the star fields (given in Table 1) including the corner stars correspond to a limiting magnitude (Lm) listed below. If you encounter gaps of more than 0.3 mag between two rows, use this magnitude value only if you do not have another estimate for the same period. Magnitude gaps of about 0.3 or more occurring for magnitudes fainter than +5.5 are marked by italic numbers. (The constellations given may help as a reminder, they do not define the actual count area.)

1		2		3		4		5		6		7		8		9		10	
Dra		Per		UMa		Gem		Aql		Peg		Cep		Tau		Leo		Vir	
N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm
1	3.08	1	2.11	1	2.35	1	1.22	1	2.71	1	2.06	1	2.47	1	0.99	1	1.41	1	1.06
2	3.18	2	2.88	2	3.18	2	2.02	2	2.99	2	2.49	2	3.23	2	1.68	2	2.13	2	2.74
3	3.57	3	3.02	3	3.65	3	3.01	3	3.37	3	2.84	3	4.07	3	3.00	3	2.23	3	3.38
4	3.74	4	3.78	4	3.78	4	3.79	4	4.45	4	4.66	4	4.23	4	4.62	4	2.56	4	4.39
5	4.23	5	4.95	5	4.48	5	5.01	5	5.16	5	5.08	5	4.79	5	4.88	5	3.33	5	5.77
6	4.78	6	5.15	6	4.56	6	5.07	6	5.30	6	5.49	6	5.12	6	4.95	6	4.41	6	5.80
7	4.83	7	5.55	7	4.83	7	5.34	7	*5.53*	7	5.56	7	5.17	7	5.09	7	4.78	7	5.86
8	5.00	8	5.60	8	5.13	8	5.75	8	5.98	8	*5.80*	8	5.26	8	5.29	8	5.42	8	5.92
9	5.08	9	5.79	9	5.16	9	5.76	9	*6.02*	9	6.13	9	5.29	9	5.43	9	5.44	9	5.97
10	*5.25*	10	5.80	10	5.49	10	*5.78*	10	6.31	10	6.14	10	5.36	10	5.51	10	5.48	10	5.99
11	5.96	11	5.98	11	5.66	11	6.20	11	*6.36*	11	6.17	11	*5.42*	11	5.73	11	5.50	11	*6.12*
12	6.06	12	6.01	12	5.72	12	6.37	12	6.71	12	6.25	12	5.73	12	5.84	12	5.58	12	6.41
13	6.28	13	*6.07*	13	5.79	13	6.47	13	6.72	13	6.25	13	5.95	13	6.10	13	5.73	13	6.44
14	6.42	14	6.40	14	5.97	14	6.54	14	6.77	14	6.26	14	5.96	14	6.19	14	5.92	14	6.63
15	6.50	15	6.41	15	6.19	15	6.67	15	6.80	15	6.29	15	6.00	15	6.27	15	6.14	15	6.64
16	6.60	16	6.45	16	6.30	16	6.76	16	6.90	16	6.44	16	6.14	16	6.29	16	6.17	16	6.65
17	6.63	17	6.50	17	6.35	17	6.80	17	6.91	17	6.47	17	6.19	17	6.36	17	6.27	17	6.69
18	6.65	18	6.51	18	6.41	18	6.99	18	6.96	18	6.50	18	6.23	18	6.50	18	6.27	18	6.83
19	6.66	19	6.54	19	6.49	19	7.00	19	7.00	19	6.50	19	6.44	19	6.55	19	6.31	19	6.90
20	6.68	20	6.60	20	6.49	20	7.02	20	7.05	20	6.57	20	6.47	20	6.71	20	6.40	20	7.04
21	6.68	21	6.61	21	6.54	21	7.10	21	7.06	21	6.59	21	6.48	21	6.76	21	6.43	21	7.06
22	6.70	22	6.66	22	6.59	22	7.12	22	7.07	22	6.59	22	6.63	22	6.77	22	6.52	22	7.08
23	6.79	23	6.72	23	6.72	23	7.17	23	7.09	23	6.60	23	6.69	23	6.87	23	6.61	23	7.16
24	6.86	24	6.73	24	6.77	24	7.22	24	7.10	24	6.60	24	6.70	24	6.88	24	6.64	24	7.19
25	6.86	25	6.75	25	6.83	25	7.43	25	7.11	25	6.67	25	6.71	25	6.95	25	6.78	25	7.20
26	6.86	26	6.78	26	6.85	26	7.45	26	7.27	26	6.68	26	6.72	26	7.15	26	6.81	26	7.24
27	6.86	27	6.85	27	6.99	27	7.46	27	7.28	27	6.68	27	6.84	27	7.17	27	6.84	27	7.25
28	6.87	28	6.89	28	7.01	28	7.46	28	7.38	28	6.69	28	6.88	28	7.19	28	6.85	28	7.25
29	6.89	29	6.90	29	7.06	29	7.47	29	7.39	29	6.72	29	6.92	29	7.21	29	6.95	29	7.32
30	6.92	30	7.02	30	7.12			30	7.40	30	6.73	30	6.93	30	7.30	30	7.00	30	7.33
31	6.92	31	7.03	31	7.12			31	7.41	31	6.74	31	6.94	31	7.34	31	7.02	31	7.34
32	6.93	32	7.03	32	7.19			32	7.44	32	6.82	32	6.97			32	7.06	32	7.38
33	6.94	33	7.05	33	7.20			33	7.45	33	6.87	33	7.01			33	7.07	33	7.42
34	7.02	34	7.15	34	7.23			34	7.47	34	6.89	34	7.04			34	7.10		
35	7.03	35	7.15	35	7.24					35	6.89	35	7.06			35	7.12		
36	7.04	36	7.16	36	7.30					36	7.07	36	7.08			36	7.12		
37	7.09	37	7.18	37	7.33					37	7.07	37	7.16			37	7.12		
38	7.10	38	7.22	38	7.40					38	7.10	38	7.18			38	7.13		
39	7.10	39	7.23	39	7.41					39	7.11	39	7.23			39	7.13		

1		2		3		4		5		6		7		8		9		10	
Dra		Per		UMa		Gem		Aql		Peg		Cep		Tau		Leo		Vir	
N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm
40	7.15	40	7.24	40	7.44					40	7.12	40	7.24			40	7.22		
41	7.24	41	7.24	41	7.45					41	7.12	41	7.25			41	7.26		
42	7.30	42	7.25	42	7.47					42	7.14	42	7.25			42	7.30		
43	7.31	43	7.26	43	7.48					43	7.15	43	7.27			43	7.30		
44	7.32	44	7.27	44	7.50					44	7.19	44	7.29			44	7.31		
45	7.33	45	7.28							45	7.24	45	7.30			45	7.33		
46	7.35	46	7.30							46	7.27	46	7.32			46	7.34		
47	7.35	47	7.31							47	7.33	47	7.35			47	7.36		
48	7.36	48	7.31							48	7.37	48	7.39			48	7.43		
49	7.39	49	7.33							49	7.43	49	7.43			49	7.43		
50	7.43	50	7.33							50	7.44	50	7.44			50	7.44		
51	7.50	51	7.35							51	7.45	51	7.46			51	7.45		
		52	7.35							52	7.45	52	7.49			52	7.48		
		53	7.36							53	7.45					53	7.49		
		54	7.42							54	7.49								
		55	7.45							55	7.49								
		56	7.48							56	7.50								
		57	7.49																
		58	7.50																
		59	7.50																

11		12		13		14		15		16		17		18		19		20	
Boo		Ser		Lyr-Her		Cyg		Dra-Her		UMa-CVn		Aur		And		UMi-Dra		Cam	
N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm
1	0.16	1	2.61	1	3.52	1	2.23	1	2.80	1	1.76	1	0.08	1	2.17	1	2.06	1	4.03
2	2.22	2	2.63	2	3.84	2	2.49	2	3.14	2	1.86	2	1.90	2	3.87	2	3.65	2	4.31
3	2.36	3	2.73	3	4.32	3	3.90	3	3.90	3	2.89	3	2.65	3	4.10	3	3.89	3	4.62
4	3.04	4	3.55	4	4.34	4	4.65	4	4.82	4	4.67	4	3.03	4	4.26	4	5.19	4	4.77
5	3.57	5	5.10	5	4.41	5	4.73	5	5.07	5	5.15	5	3.73	5	4.83	5	*5.50*	5	5.14
6	4.47	6	5.23	6	4.98	6	4.79	6	5.50	6	5.64	6	3.97	6	4.87	6	*5.81*	6	5.44
7	4.51	7	5.39	7	5.42	7	4.94	7	5.67	7	5.79	7	4.33	7	4.96	7	6.20	7	5.47
8	4.79	8	5.39	8	5.49	8	5.06	8	5.82	8	5.85	8	4.52	8	5.01	8	6.33	8	5.62
9	4.81	9	5.51	9	5.56	9	5.39	9	5.92	9	5.88	9	5.21	9	5.04	9	6.40	9	*5.63*
10	4.93	10	5.53	10	5.72	10	5.58	10	5.98	10	*6.11*	10	5.46	10	5.64	10	6.53	10	6.00
11	5.28	11	*5.57*	11	5.99	11	5.64	11	6.06	11	6.42	11	5.64	11	5.67	11	*6.70*	11	6.04
12	5.51	12	*5.87*	12	6.01	12	5.87	12	6.11	12	6.48	12	5.91	12	5.94	12	7.00	12	6.17
13	5.67	13	6.25	13	6.03	13	5.91	13	6.16	13	6.55	13	5.99	13	5.98	13	7.17	13	6.17
14	5.79	14	6.34	14	6.05	14	6.04	14	6.17	14	6.70	14	6.09	14	6.13	14	7.22	14	6.20
15	5.81	15	6.51	15	6.10	15	6.25	15	6.29	15	6.79	15	6.11	15	6.13	15	7.25	15	6.21
16	5.88	16	6.52	16	*6.17*	16	6.29	16	6.34	16	6.80	16	6.23	16	6.39	16	7.30	16	6.24
17	5.90	17	6.54	17	6.47	17	6.31	17	6.36	17	6.81	17	6.30	17	6.42	17	7.33	17	6.25
18	6.00	18	6.71	18	6.59	18	6.34	18	6.36	18	6.84	18	6.30	18	6.52	18	7.41	18	6.35
19	6.01	19	6.85	19	6.62	19	6.38	19	6.45	19	6.96	19	6.41	19	6.55	19	7.45	19	6.36
20	6.04	20	6.87	20	6.67	20	6.47	20	6.46	20	6.98	20	6.44	20	6.58	20	7.49	20	6.38
21	6.06	21	6.88	21	6.70	21	6.48	21	6.58	21	6.98	21	6.47	21	6.60			21	6.43
22	6.13	22	6.95	22	6.89	22	6.60	22	6.66	22	7.05	22	6.48	22	6.64			22	6.49
23	6.13	23	6.96	23	6.93	23	6.73	23	6.66	23	7.06	23	6.51	23	6.65			23	6.61
24	6.22	24	6.97	24	7.00	24	6.74	24	6.74	24	7.23	24	6.54	24	6.68			24	6.62
25	6.27	25	7.04	25	7.01	25	6.82	25	6.78	25	7.26	25	6.56	25	6.68			25	6.63
26	6.32	26	7.13	26	7.02	26	6.87	26	6.82	26	7.28	26	6.57	26	6.77			26	6.64
27	6.38	27	7.16	27	7.02	27	6.90	27	6.85	27	7.33	27	6.58	27	6.77			27	6.64
28	6.38	28	7.16	28	7.03	28	6.96	28	6.87	28	7.38	28	6.58	28	6.84			28	6.66
29	6.40	29	7.19	29	7.04	29	7.00	29	6.87	29	7.47	29	6.59	29	6.90			29	6.69
30	6.40	30	7.21	30	7.06	30	7.02	30	7.00	30	7.48	30	6.60	30	6.95			30	6.71
31	6.56	31	7.23	31	7.08	31	7.02	31	7.02			31	6.63	31	7.07			31	6.74

11		12		13		14		15		16		17		18		19		20	
Boo		Ser		Lyr-Her		Cyg		Dra-Her		UMa-CVn		Aur		And		UMi-Dra		Cam	
N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm
32	6.68	32	7.25	32	7.19	32	7.08	32	7.04			32	6.66	32	7.14			32	6.81
33	6.70	33	7.26	33	7.23	33	7.09	33	7.12			33	6.69	33	7.19			33	6.82
34	6.71	34	7.27	34	7.27	34	7.10	34	7.17			34	6.75	34	7.21			34	6.85
35	6.76	35	7.27	35	7.29	35	7.12	35	7.23			35	6.77	35	7.23			35	6.86
36	6.77	36	7.28	36	7.31	36	7.13	36	7.24			36	6.80	36	7.23			36	6.88
37	6.79	37	7.32	37	7.33	37	7.23	37	7.35			37	6.81	37	7.25			37	6.89
38	6.83	38	7.34	38	7.34	38	7.27	38	7.37			38	6.82	38	7.26			38	6.89
39	6.84	39	7.35	39	7.37	39	7.29	39	7.38			39	6.84	39	7.26			39	6.92
40	6.87	40	7.36	40	7.37	40	7.30	40	7.39			40	6.86	40	7.27			40	6.95
41	6.89	41	7.41	41	7.38	41	7.32	41	7.47			41	6.86	41	7.27			41	6.97
42	6.94	42	7.42	42	7.41	42	7.33	42	7.48			42	6.89	42	7.30			42	6.98
43	6.95	43	7.43	43	7.43	43	7.34	43	7.49			43	6.93	43	7.33			43	6.99
44	6.96	44	7.44	44	7.44	44	7.42	44	7.49			44	6.95	44	7.43			44	7.01
45	6.96	45	7.47	45	7.45	45	7.42	45	7.50			45	6.95	45	7.44			45	7.03
46	7.01	46	7.48	46	7.45	46	7.43	46	7.50			46	6.98	46	7.46			46	7.05
47	7.03	47	7.48	47	7.46	47	7.44					47	6.98	47	7.47			47	7.08
48	7.04	48	7.50	48	7.46	48	7.44					48	7.01	48	7.48			48	7.12
49	7.12	49	7.50	49	7.49	49	7.44					49	7.16	49	7.50			49	7.12
50	7.14					50	7.47					50	7.19					50	7.14
51	7.15					51	7.47					51	7.20					51	7.17
52	7.17											52	7.21					52	7.27
53	7.21											53	7.24					53	7.28
54	7.22											54	7.24					54	7.30
56	7.25											60	7.27					56	7.32
63	7.30											61	7.31					57	7.37
66	7.38											67	7.37					59	7.40
67	7.43											68	7.40					61	7.43
70	7.45											71	7.46					64	7.45
73	7.49											76	7.50					65	7.47

21		22		23		24		25		26		27		28		29		30	
Aqr		Lep-Ori		Crv		Lib		Sco		TrA-Cen		Cru		Car		Hyi		Tuc-Pav	
N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm
1	1.23	1	0.28	1	2.59	1	2.61	1	1.07	1	-0.01	1	0.64	1	1.67	1	2.82	1	1.92
2	3.27	2	2.84	2	2.66	2	2.75	2	2.29	2	1.91	2	1.31	2	1.95	2	2.86	2	2.86
3	3.68	3	3.29	3	2.97	3	3.28	3	3.96	3	2.84	3	1.58	3	2.25	3	3.26	3	3.42
4	3.96	4	3.87	4	3.01	4	3.92	4	5.26	4	2.88	4	1.65	4	3.84	4	4.08	4	3.65
5	4.48	5	4.28	5	5.21	5	4.56	5	5.40	5	3.76	5	4.31	5	3.96	5	4.69	5	3.95
6	4.72	6	4.43	6	5.81	6	5.19	6	*5.50*	6	3.85	6	4.56	6	4.00	6	4.74	6	4.23
7	5.54	7	4.47	7	*5.95*	7	5.64	7	5.84	7	4.11	7	4.59	7	4.33	7	5.51	7	4.76
8	*5.66*	8	4.78	8	6.40	8	*5.72*	8	5.92	8	4.85	8	4.61	8	5.46	8	5.57	8	4.86
9	*5.98*	9	5.46	9	6.62	9	6.08	9	6.00	9	5.08	9	4.69	9	5.54	9	*5.67*	9	5.12
10	6.28	10	5.49	10	6.84	10	6.14	10	6.09	10	5.10	10	4.92	10	5.78	10	5.99	10	5.15
11	6.30	11	5.68	11	7.06	11	6.15	11	6.15	11	5.11	11	5.50	11	*5.79*	11	6.09	11	5.18
12	*6.35*	12	5.68	12	7.25	12	6.17	12	6.32	12	5.17	12	5.75	12	6.36	12	6.36	12	5.61
13	6.79	13	5.69	13	7.30	13	6.19	13	6.41	13	5.18	13	5.82	13	6.36	13	6.43	13	5.62
14	6.82	14	5.72	14	7.41	14	6.41	14	6.47	14	5.29	14	6.04	14	6.49	14	6.57	14	5.76
15	6.97	15	5.82	15	7.44	15	6.46	15	6.56	15	5.50	15	6.20	15	6.54	15	6.59	15	5.92
16	7.05	16	5.96	16	7.44	16	6.50	16	6.56	16	5.72	16	6.20	16	6.63	16	6.65	16	6.09
17	7.25	17	5.96	17	7.46	17	6.63	17	6.62	17	5.75	17	6.23	17	6.72	17	6.66	17	6.22
18	7.42	18	6.05			18	6.64	18	6.85	18	5.77	18	6.42	18	6.85	18	6.69	18	6.22
19	7.45	19	6.15			19	6.67	19	6.90	19	5.89	19	6.61	19	6.90	19	6.69	19	6.28
20	7.46	20	6.23			20	6.75	20	6.97	20	5.89	20	6.61	20	6.93	20	6.71	20	6.33
21	7.48	21	6.27			21	6.76	21	6.98	21	5.95	21	6.66	21	6.99	21	6.77	21	6.35
22	7.50	22	6.35			22	6.76	22	7.01	22	5.95	22	6.69	22	7.04	22	6.81	22	6.36

21		22		23		24		25		26		27		28		29		30	
Aqr		Lep-Ori		Crv		Lib		Sco		TrA-Cen		Cru		Car		Hyi		Tuc-Pav	
N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm	N	Lm
		23	6.40			23	6.80	23	7.07	23	6.02	23	6.73	23	7.08	23	6.84	23	6.40
		24	6.42			24	6.87	24	7.13	24	6.07	24	6.74	24	7.14	24	6.85	24	6.50
		25	6.46			25	6.94	25	7.14	25	6.12	25	6.75	25	7.15	25	6.86	25	6.59
		26	6.47			26	7.07	26	7.15	26	6.14	26	6.92	26	7.16	26	6.88	26	6.70
		27	6.54			27	7.14	27	7.26	27	6.16	27	6.93	27	7.18	27	6.89	27	6.70
		28	6.68			28	7.16	28	7.40	28	6.17	28	6.96	28	7.19	28	6.89	28	6.73
		29	6.71			29	7.19	29	7.46	29	6.20	29	6.98	29	7.25	29	6.91	29	6.77
		30	6.73			30	7.20			30	6.20	30	7.07	30	7.29	30	6.94	30	6.83
		31	6.75			31	7.22			31	6.21	31	7.11	31	7.31	31	7.01	31	6.84
		32	6.76			32	7.24			32	6.22	32	7.13	32	7.37	32	7.09	32	6.86
		33	6.96			33	7.25			33	6.25	33	7.19	33	7.38	33	7.09	33	6.87
		34	7.02			34	7.29			34	6.25	34	7.19	34	7.38	34	7.10	34	6.91
		35	7.04			35	7.29			35	6.30	35	7.21	35	7.38	35	7.13	35	6.92
		36	7.12			36	7.32			36	6.31	36	7.24	36	7.38	36	7.19	36	6.92
		37	7.14			37	7.35			37	6.33	37	7.26	37	7.44	37	7.22	37	6.97
		38	7.14			38	7.37			38	6.39	38	7.27	38	7.45	38	7.22	38	7.00
		39	7.21			39	7.38			40	6.42	39	7.29	39	7.46	39	7.23	39	7.03
		40	7.21			40	7.41			41	6.48	40	7.31			40	7.24	40	7.09
		41	7.22			41	7.46			43	6.50	41	7.37			41	7.26	41	7.10
		42	7.28			42	7.49			47	6.57	42	7.38			42	7.27	42	7.10
		43	7.32			43	7.50			49	6.61	43	7.40			43	7.29	43	7.12
		44	7.32							50	6.70	44	7.45			44	7.30	44	7.15
		45	7.33							53	6.75	45	7.50			45	7.30	45	7.18
		46	7.34							54	6.81					46	7.32	46	7.20
		47	7.34							58	6.85					47	7.32	47	7.21
		48	7.37							64	6.90					48	7.37	48	7.23
		49	7.38							66	6.95					49	7.37	49	7.24
		50	7.38							70	7.00					50	7.37	50	7.24
		51	7.41							75	7.05					51	7.38	51	7.27
		52	7.42							76	7.10					52	7.39	52	7.35
		53	7.43							81	7.14					53	7.41	53	7.36
		54	7.43							83	7.20					54	7.46	54	7.41
		55	7.45							86	7.24					55	7.47	55	7.44
		56	7.45							90	7.29					56	7.50	56	7.44
		57	7.47							92	7.34					57	7.50	57	7.47
		58	7.48							97	7.40							58	7.48
										102	7.45							59	7.50
										106	7.50							60	7.50

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