Compass Adjusting – Tricks O' the Trade

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Intro

- RSP background
- !!Absolute/Nonmagnetic standard!! – cannot use a compass to correct a compass, duh
- Must have trustworthy, verifiable reference

Approach

- 30,000 ft view: skip details due to time
- Highlight “expedient” techniques
- Practical tips & tricks
- Avoid thinking on the fly; let the technique guide you

Adjustment Prelims

- Calm water (FAC) – protected space
- compass survey – access to the adjustment mechanism
- check lubber line: “A” coefficient
- check pivot/jewel (sensibility)
- start E-W: “B” coefficient
- next N-S: “C” coefficient

Adjustment Techniques

a) correcting for onboard influences

!problem is <u>not</u> the compass!

b) correcting for vessel magnetic errors

c) capturing residual errors

(deviation card)

Two approaches:

- Gyro
- Sun Azimuth

I) Gyro --> sun not required!

cage gyro to starting heading

reciprocal course

II) Pelorus/Sun Compass

- Find --> Sun Azimuth

  Trick: calculate & plot (show)

assume you can find azimuths

HO 260 (next)

calculator: HP48

spread sheet (next)

- Find --> Local Apparent Time

  Trick: 2nd watch (set watch)

three corrections:

a) standard time (zone)

b) Meridian Passage (Eq'n of Time)

c) longitude Δt (longitude offset)

assume you can make watch corrections

LATITUDE 42°.

DECLINATION—CONTRARY NAME TO—LATITUDE.

Dec.	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°	17°	18°	19°	20°	21°	22°	23°	Dec.
	March. 21	23	26	28	31	April. 3	5	8	11	13	16	19	22	25.	28	May. 1	5	8	12	16	21	26	June 1	10	
	September. 23	21	18	16	13	10	8	5	2	August. 30	28	25	22	19	16	12	9	5	2	July. 28	24	19	12	3	
Apparent Time. A. M.	September. 23	26	28	October. 1	4	6	9	11	14	17	19	22	25	28	31	November. 3	6	10	14	17	22	27	December. 3	11	Apparent Time. P. M.
	March. 21	18	16	13	11	8	6	3	1	February. 26	23	20	18	15	12	9	5	2	January. 29	25	21	16	10	2	
h. m.	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	h. m.
VI 00	90 00	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	VI 00
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20	93 21	94 05	94 50	95 35	96 19	97 04	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	40
30	95 02	95 47	96 31	97 16	98 00	98 44	99 28	100 13	100 57	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	30
40	96 44	97 28	98 13	98 57	99 41	100 26	101 10	101 54	102 38	103 22	104 06	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	20
50	98 26	99 11	99 55	100 40	101 24	102 08	102 52	103 36	104 19	105 03	105 47	106 30	107 14	107 57	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10
VII 00	100 10	100 54	101 39	102 23	103 07	103 51	104 35	105 19	106 02	106 46	107 29	108 12	108 55	109 39	110 22	111 05	.....	.....	.....	.....	.....	.....	.....	.....	V 00
10	101 55	102 40	103 24	104 08	104 52	105 36	106 19	107 03	107 46	108 29	109 12	109 55	110 38	111 21	112 04	112 46	113 29	114 11	114 54	.....	.....	.....	.....	.....	50
20	103 41	104 26	105 10	105 54	106 38	107 22	108 05	108 49	109 32	110 15	110 57	111 40	112 22	113 05	113 47	114 29	115 11	115 53	116 35	117 17	117 59	.....	.....	.....	40
30	105 30	106 14	106 59	107 43	108 26	109 10	109 53	110 36	111 19	112 02	112 44	113 26	114 08	114 50	115 32	116 14	116 55	117 37	118 18	119 00	119 41	120 22	121 03	.....	30
40	107 20	108 04	108 49	109 32	110 16	111 00	111 43	112 26	113 08	113 50	114 33	115 14	115 56	116 38	117 19	118 00	118 41	119 22	120 03	120 44	121 24	122 05	122 45	123 26	20
50	109 12	109 57	110 41	111 25	112 09	112 52	113 35	114 17	114 59	115 41	116 23	117 05	117 46	118 27	119 08	119 48	120 29	121 09	121 49	122 29	123 09	123 49	124 29	125 09	10
VIII 00	111 07	111 52	112 36	113 20	114 03	114 46	115 29	116 11	116 53	117 34	118 16	118 57	119 38	120 18	120 58	121 38	122 18	122 58	123 38	124 17	124 56	125 36	126 15	126 53	IV 00
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20	115 06	115 51	116 35	117 18	118 01	118 43	119 25	120 07	120 48	121 29	122 09	122 49	123 29	124 08	124 47	125 26	126 05	126 43	127 21	127 59	128 37	129 14	129 52	130 29	40
30	117 11	117 55	118 38	119 22	120 04	120 46	121 28	122 09	122 50	123 30	124 10	124 49	125 28	126 07	126 46	127 24	128 02	128 39	129 17	129 54	130 31	131 07	131 44	132 20	30
40	119 19	120 02	120 46	121 29	122 11	122 53	123 34	124 14	124 54	125 34	126 14	126 52	127 31	128 09	128 47	129 24	130 01	130 38	131 15	131 51	132 27	133 02	133 38	134 13	20
50	121 31	122 15	122 57	123 40	124 22	125 03	125 43	126 23	127 03	127 42	128 20	128 58	129 36	130 14	130 51	131 27	132 03	132 39	133 15	133 50	134 25	135 00	135 35	136 09	10
IX 00	123 47	124 30	125 13	125 55	126 36	127 16	127 56	128 36	129 15	129 53	130 31	131 08	131 45	132 22	132 58	133 33	134 09	134 44	135 18	135 52	136 27	137 00	137 34	138 07	III 00
10	126 08	126 51	127 33	128 14	128 55	129 34	130 14	130 52	131 30	132 08	132 45	133 21	133 57	134 33	135 08	135 42	136 17	136 51	137 24	137 57	138 30	139 03	139 36	140 08	50
20	128 34	129 16	129 57	130 38	131 18	131 57	132 35	133 13	133 50	134 26	135 01	135 38	136 13	136 47	137 21	137 55	138 28	139 01	139 33	140 05	140 37	141 09	141 40	142 11	40
30	131 05	131 47	132 27	133 06	133 45	134 23	135 01	135 37	136 13	136 49	137 24	137 58	138 32	139 05	139 38	140 10	140 42	141 14	141 45	142 16	142 47	143 17	143 47	144 16	30
40	133 42	134 22	135 01	135 40	136 18	136 55	137 31	138 06	138 41	139 15	139 49	140 22	140 55	141 27	141 58	142 29	143 00	143 30	144 00	144 30	144 59	145 28	145 57	146 25	20
50	136 24	137 03	137 41	138 19	138 55	139 31	140 06	140 40	141 13	141 46	142 18	142 50	143 21	143 52	144 22	144 52	145 21	145 50	146 18	146 46	147 14	147 41	148 08	148 35	10
X 00	139 13	139 50	140 27	141 03	141 38	142 12	142 45	143 18	143 50	144 21	144 52	145 22	145 52	146 21	146 50	147 18	147 45	148 13	148 39	149 06	149 32	149 58	150 23	150 48	II 00
10	142 07	142 43	143 18	143 52	144 25	144 58	145 30	146 01	146 31	147 00	147 30	147 58	148 26	148 53	149 20	149 47	150 13	150 38	151 03	151 28	151 53	152 17	152 41	153 04	50
20	145 08	145 42	146 15	146 47	147 18	147 49	148 18	148 48	149 16	149 44	150 11	150 38	151 04	151 29	151 54	152 19	152 43	153 07	153 30	153 53	154 16	154 39	155 01	155 22	40
30	148 14	148 46	149 17	149 47	150 16	150 45	151 12	151 39	152 06	152 31	152 57	153 21	153 45	154 09	154 32	154 55	155 17	155 39	156 00	156 21	156 42	157 03	157 23	157 43	30
40	151 27	151 57	152 25	152 53	153 19	153 45	154 11	154 36	155 00	155 23	155 46	156 08	156 30	156 52	157 13	157 33	157 53	158 13	158 33	158 52	159 11	159 29	159 47	160 05	20
50	154 46	155 13	155 38	156 03	156 27	156 51	157 14	157 36	157 57	158 18	158 39	158 59	159 18	159 37	159 56	160 15	160 33	160 50	161 08	161 25	161 41	161 58	162 14	162 30	10
XI 00	158 11	158 34	158 57	159 19	159 40	160 00	160 20	160 40	160 59	161 17	161 35	161 53	162 10	162 26	162 43	162 59	163 14	163 30	163 45	164 00	164 14	164 29	164 42	164 56	I 00
10	161 40	162 00	162 20	162 38	162 56	163 14	163 31	163 47	164 03	164 19	164 34	164 49	165 04	165 18	165 32	165 45	165 58	166 11	166 24	166 37	166 49	167 01	167 13	167 24	50
20	165 14	165 31	165 46	166 02	166 16	166 31	166 45	166 58	167 11	167 24	167 37	167 48	168 00	168 11	168 23	168 34	168 44	168 55	169 05	169 15	169 25	169 35	169 44	169 54	40
30	168 52	169 05	169 17	169 29	169 40	169 51	170 01	170 11	170 21	170 31	170 40	170 49	170 58	171 07	171 15	171 24	171 32	171 40	171 48	171 55	172 03	172 10	172 17	172 24	30
40	172 33	172 42	172 50	172 58	173 05	173 13	173 19	173 26	173 33	173 40	173 46	173 52	173 58	174 04	174 09	174 15	174 20	174 26	174 31	174 36	174 41	174 46	174 51	174 56	20
XI 50	176 16	176 20	176 24	176 28	176 32	176 36	176 39	176 43	176 46	176 49	176 53	176 56	176 59	177 02	177 05	177 07	177 10	177 13	177 15	177 18	177 20	177 23	177 25	177 28	XII 10
	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	h. m.	
Sun rises . .	6 00	6 04	6 07	6 11	6 14	6 18	6 22	6 25	6 29	6 33	6 37	6 40	6 44	6 48	6 52	6 56	7 00	7 04	7 08	7 12	7 17	7 21	7 25	7 30	Sun rises.
Sun sets . .	6 00	5 56	5 53	5 49	5 46	5 42	5 38	5 35	5 31	5 27	5 23	5 20	5 16	5 12	5 08	5 04	5 00	4 56	4 52	4 48	4 43	4 39	4 35	4 30	Sun sets.
Azimuth . .	° ′ 90 00	° ′ 91 21	° ′ 92 42	° ′ 94 02	° ′ 95 23	° ′ 96 44	° ′ 98 05	° ′ 99 26	° ′ 100 48	° ′ 102 09	° ′ 103 31	° ′ 104 53	° ′ 106 15	° ′ 107 37	° ′ 109 00	° ′ 110 23	° ′ 111 46	° ′ 113 10	° ′ 114 34	° ′ 115 59	° ′ 117 24	° ′ 118 50	° ′ 120 16	° ′ 121 43	Azimuth.

In North latitude, when the body is rising or East of the meridian, the tabulated azimuths are reckoned from North to East; and when the body is setting or West of the meridian, the tabulated azimuths are reckoned from North to West.

In South latitude, when the body is rising or East of the meridian, the tabulated azimuths are reckoned from South to East; and when the body is setting or West of the meridian, the tabulated azimuths are reckoned from South to West.

November.

25	28	31	3	6	10	14	17	22	

February. January.

18	15	12	9	5	2	29	25	21	
° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	‹
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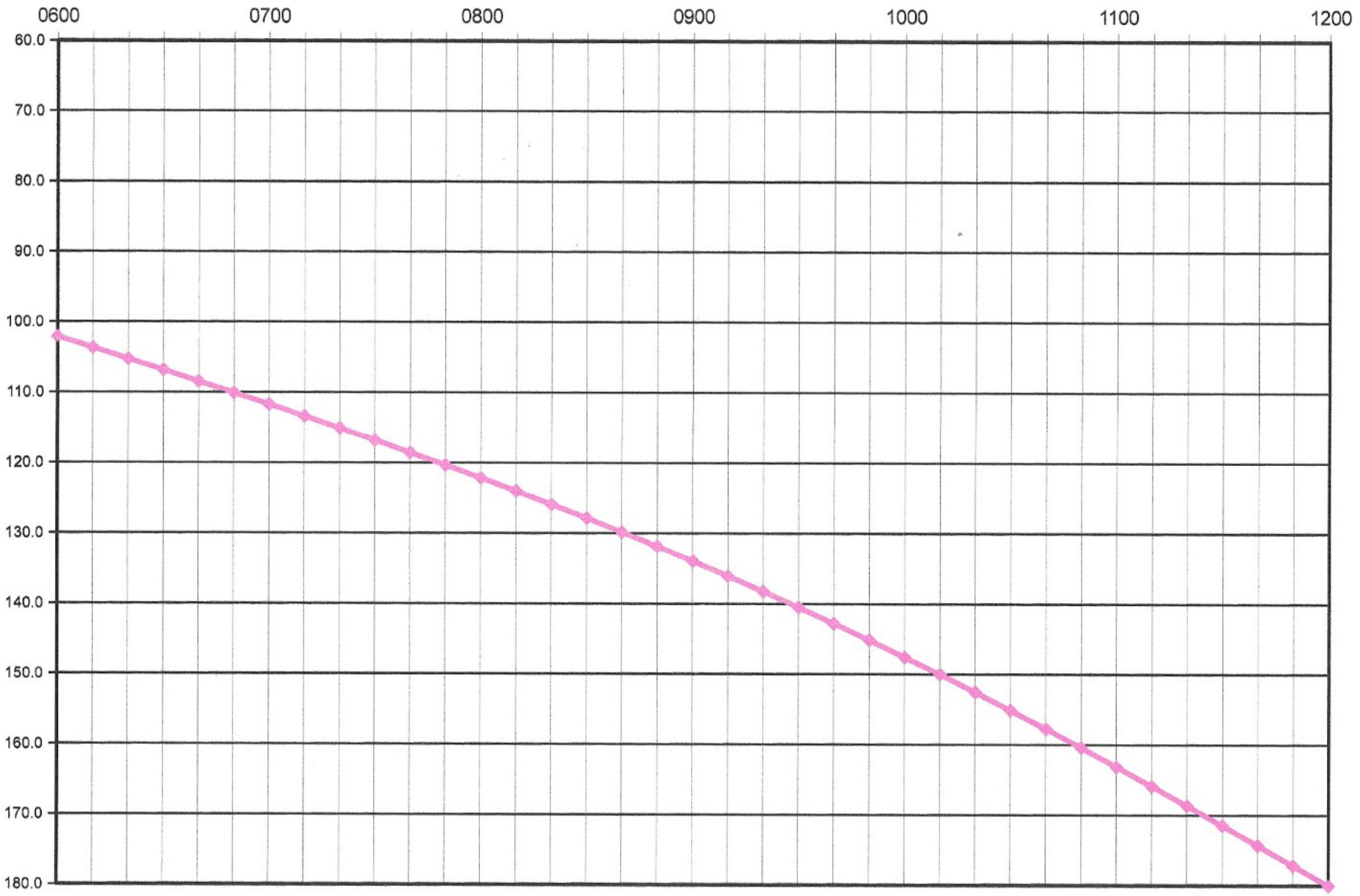
7 14	107 57	.....	.....	.....	.....	.....	.....	.....	..
3 55	109 39	110 22	111 05	.....	.....	.....	.....	.....	..
0 38	111 21	112 04	112 46	113 29	114 11	114 54	.....	.....	..
2 22	113 05	113 47	114 29	115 11	115 53	116 35	117 17	117 59	..
4 08	114 50	115 32	116 14	116 55	117 37	118 18	119 00	119 41	12
5 56	116 38	117 19	118 00	118 41	119 22	120 03	120 44	121 24	12
7 46	118 27	119 08	119 48	120 29	121 09	121 49	122 29	123 09	12
9 38	120 18	120 58	121 38	122 18	122 58	123 38	124 17	124 56	12
1 32	122 12	122 52	123 31	124 11	124 50	125 28	126 07	126 46	12
3 29	124 08	124 47	125 26	126 05	126 43	127 21	127 59	128 37	12
5 28	126 07	126 46	127 24	128 02	128 39	129 17	129 54	130 31	13
7 31	128 09	128 47	129 24	130 01	130 38	131 15	131 51	132 27	13
9 36	130 14	130 51	131 27	132 03	132 39	133 15	133 50	134 25	13
1 45	132 22	132 58	133 33	134 09	134 44	135 18	135 52	136 27	13
3 57	134 33	135 08	135 42	136 17	136 51	137 24	137 57	138 30	13
6 13	136 47	137 21	137 55	138 28	139 01	139 33	140 05	140 37	14
8 32	139 05	139 38	140 10	140 42	141 14	141 45	142 16	142 47	14
0 55	141 27	141 58	142 29	143 00	143 30	144 00	144 30	144 59	14
3 21	143 52	144 22	144 52	145 21	145 50	146 18	146 46	147 14	14
5 52	146 21	146 50	147 18	147 45	148 13	148 39	149 06	149 32	14
8 26	148 53	149 20	149 47	150 13	150 38	151 03	151 28	151 53	15
1 04	151 29	151 54	152 19	152 43	153 07	153 30	153 53	154 16	15
3 45	154 09	154 32	154 55	155 17	155 39	156 00	156 21	156 42	15
6 30	156 52	157 13	157 33	157 53	158 13	158 33	158 52	159 11	15
9 18	159 37	159 56	160 15	160 33	160 50	161 08	161 25	161 41	16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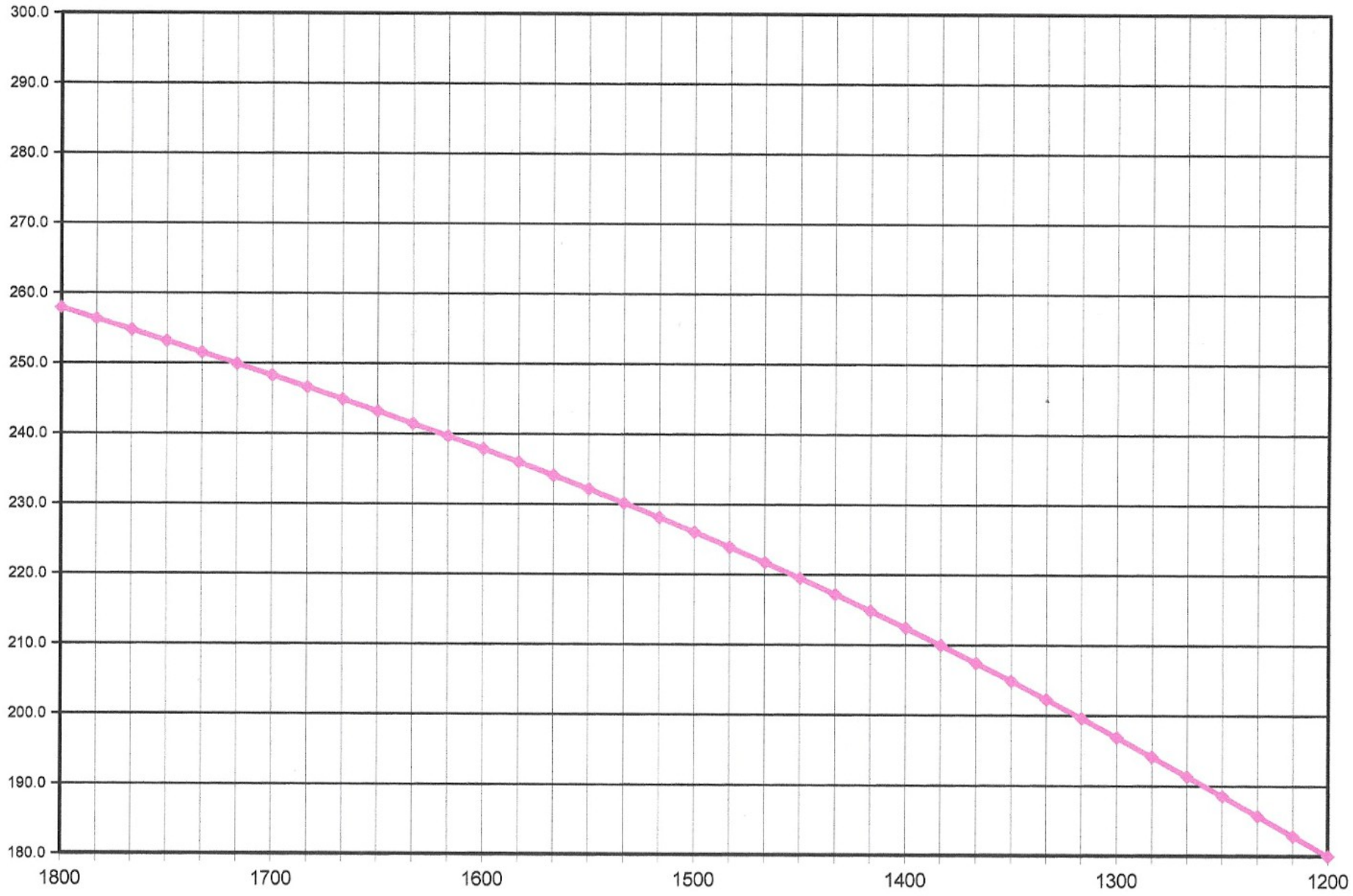
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230.0
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200.0
190.0
180.0
1800
1700
1600
1500
1400
1300
1200


10/24/2016

Problem:

finding correction on all headings

Trick: azimuth plate

45deg around the card

Add Variation Correction

Worksheet:

a) capture deviations

b) vessel details

Deviation table – examples online

Final Check.....

!Shore Bearings!

not buoys

Special Topics

- Fluxgate compass – auto adjust features
- GPS – A “Was-O-Meter”; always catching up.
- Compass Care & Feeding –
  !Off the boat for winter storage!
- Repair issues – bubble & cracks, pivot & jewel
- Steel vessels –
  vertical field correction
  quad spheres (navigator's balls)
- Judging the owner/helmsman – who drives
- “Stuck” compass
- Future of the compass –
  manufacturers, electronic, auto adjust

Resources

HO No 226 – Handbook of Magnetic Compass Adjusting

HO No 71 – Azimuths of the Sun (1918)

HO No 260 – Azimuths of the Sun (1964)

Compass Book – Mike Harris

Compass Correction – Capt George Reid

Ritchie Compass website:
https://www.ritchienavigation.com/media/336120/compensation-instructions.pdf

Great Lakes Compass:
www.greatlakescompass.com