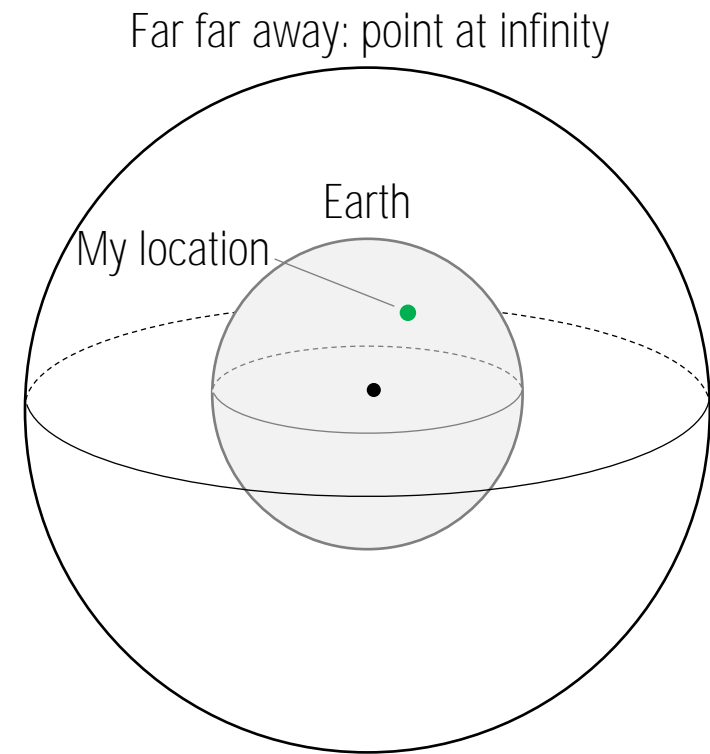


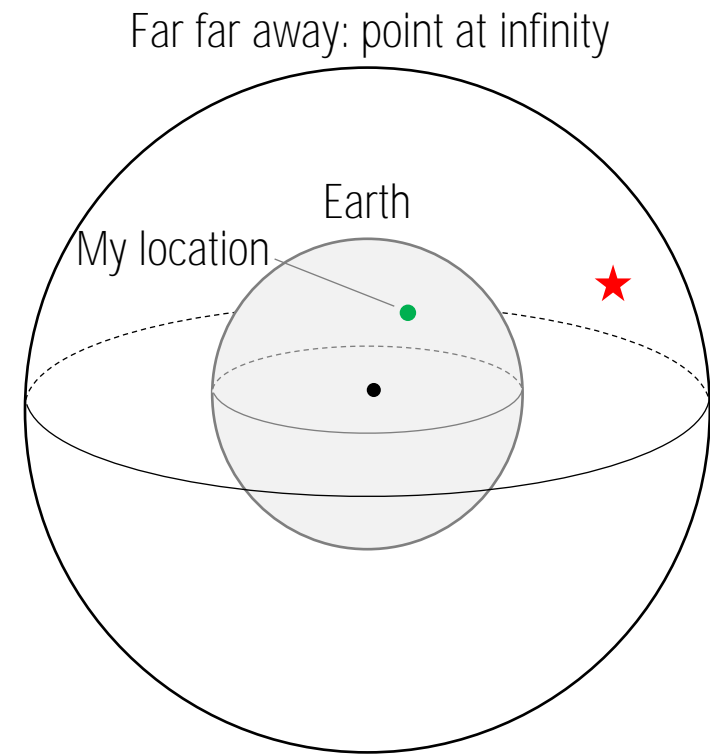
Celestial Navigaion

Where am I?

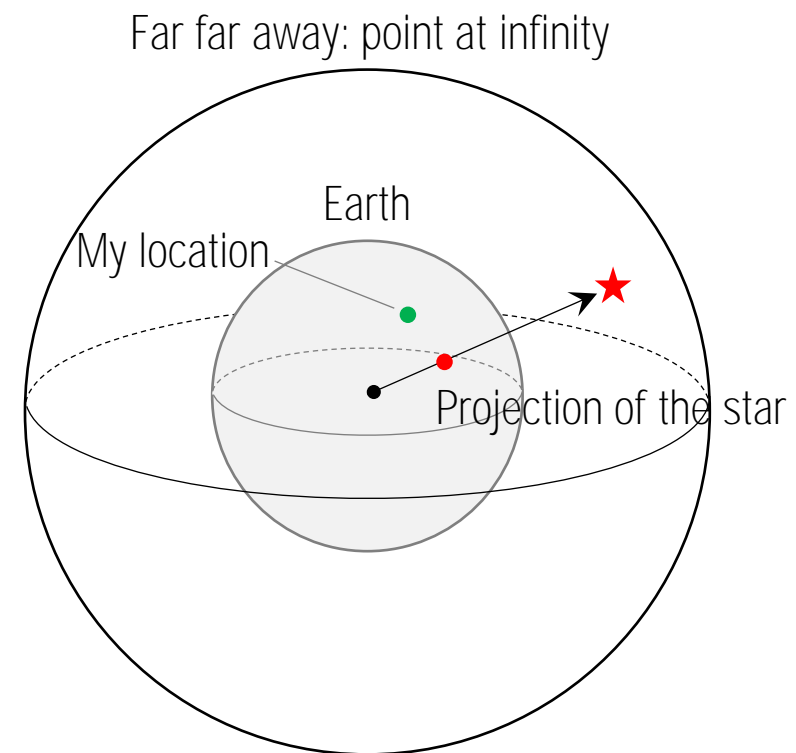
Celestial Navigation



Celestial Navigation



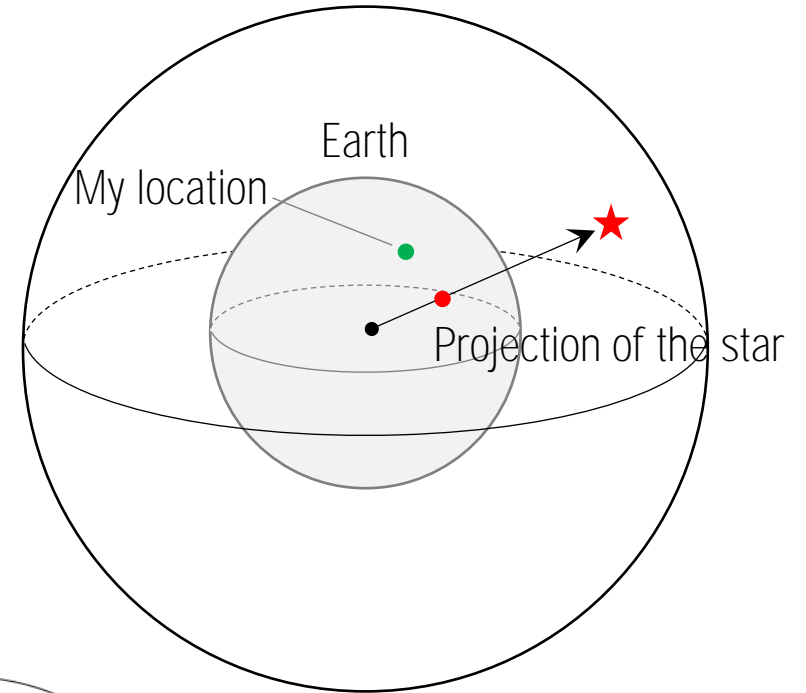
Celestial Navigation



Celestial Navigation



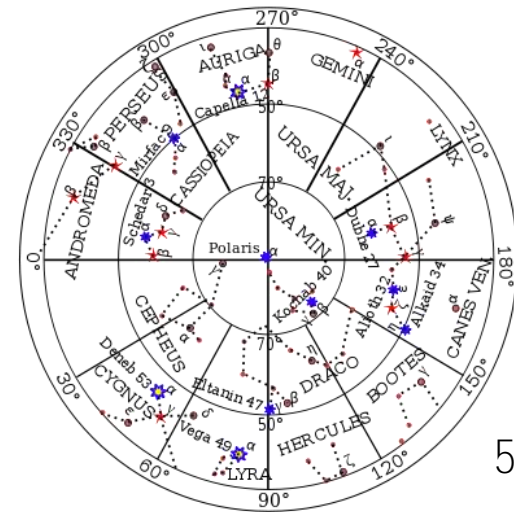
Far far away: point at infinity



292

GREENWICH P. M. 1942 MAY 26 (TUESDAY)

GCT	☉ SUN		♃ VENUS-3.6		♂ MARS 1.9		♃ JUPITER-1.5		☾ MOON		Lat.	Sun-rise	Twil.	Moon-rise	Diff.
	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.					
12 00	0 47	N21 04	63 25	41 45 N 6 53	313 11	N23 31	337 04	N23 14	230 23	S 2 34					
10	3 17		65 56	44 15	315 41		339 34		232 48						
20	5 47		68 26	46 45	318 11		342 04		235 13						
30	8 17		70 57	49 15	320 41		344 35		237 38						
40	10 47		73 27	51 45	323 11		347 05		240 03						
50	13 17		75 57	54 15	325 41		349 35		242 27						
13 00	15 47	N21 04	78 28	56 45 N 6 54	328 11	N23 31	352 06	N23 14	244 52	S 2 45 60	3 00	75	15	08 87	
10	18 17		80 58	59 15	330 42		354 36		247 17		17	64		06 85	
20	20 47		83 29	61 45	333 12		357 06		249 42		30	55		04 83	
30	23 17		85 59	64 15	335 42		359 37		252 07		51	54		03 80	
40	25 47		88 30	66 45	338 12		2 07		254 32		53	52		02 78	
50	28 17		91 00	69 15	340 42		4 37		256 56		54	50		4 02 42	
14 00	30 47	N21 05	93 30	71 45 N 6 55	343 12	N23 31	7 08	N23 14	259 21	S 2 56 45	21	36	14	58 72	
10	33 17		96 01	74 15	345 42		9 38		261 46		2	58		56 69	
20	35 47		98 31	76 45	348 13		12 08		264 11		3	00		54 66	
30	38 17		101 02	79 15	350 43		14 38		266 36		5	01		52 64	
40	40 47		103 32	81 45	353 13		17 09		269 01		04	20		49 60	
50	43 17		106 02	84 15	355 43		19 39		271 26		06	10		47 56	
15 00	45 47	N21 05	108 33	86 45 N 6 56	358 13	N23 31	22 09	N23 14	273 50	S 3 08 0	5 53	22		45 53	
10	48 17		111 03	89 15	0 43		24 40		276 15		09				
20	50 47		113 34	91 45	3 13		27 10		278 40		11	10		6 09 23	
30	53 17		116 04	94 14	5 43		29 40		281 05		13	20		25 24	
40	55 47		118 34	96 44	8 14		32 11		283 30		15	30		43 25	
50	58 17		121 05	99 14	10 44		34 41		285 55		17	35		6 54 27	
16 00	60 47	N21 06	123 35	101 44 N 6 57	13 14	N23 30	37 11	N23 14	288 19	S 3 19 40	7 07	30		34 37	
10	63 17		126 06	104 14	15 44		39 42		290 44		21	45		31 33	
20	65 47		128 36	106 44	18 14		42 12		293 09		23	50		29 37	

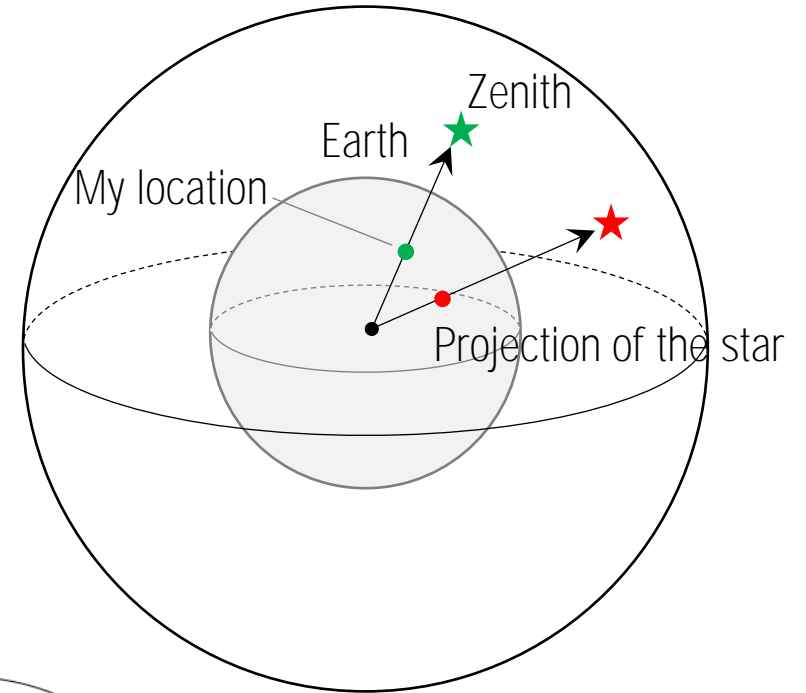


57 stars for navigation

Celestial Navigation



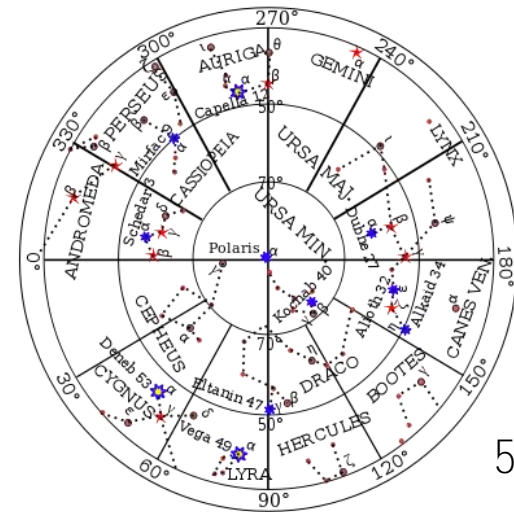
Far far away: point at infinity



292

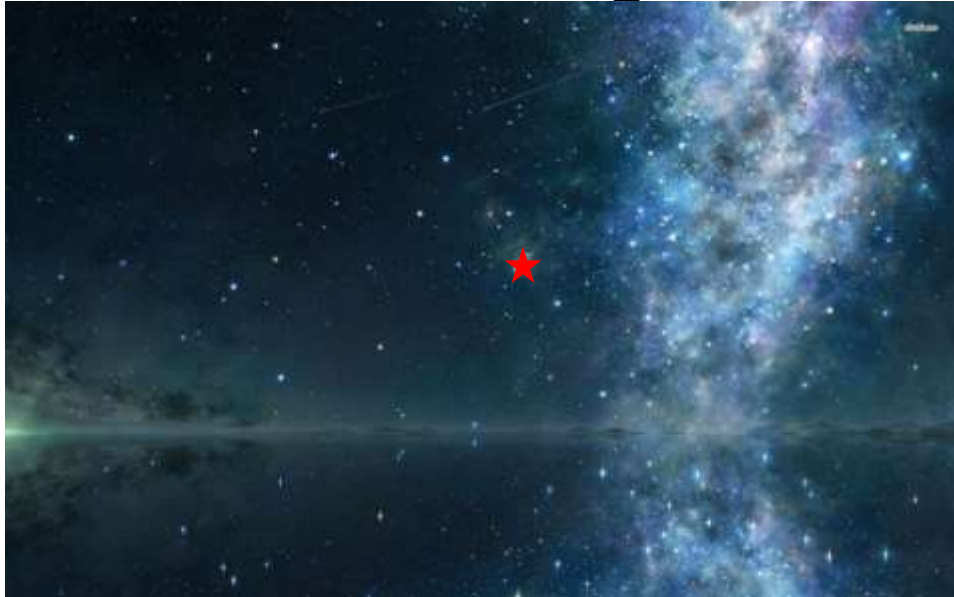
GREENWICH P. M. 1942 MAY 26 (TUESDAY)

GCT	☉ SUN		♀ VENUS-3.6		♂ MARS 1.9		♃ JUPITER-1.5		♁ MOON		Lat.	Sun-rise	Twil.	Moon-rise	Diff.
	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.					
12 00	0 47	N21 04	63 25	41 45 N 6 53	313 11	N23 31	337 04	N23 14	230 23	S 2 34					
10	3 17		65 56	44 15	315 41		339 34		232 48						
20	5 47		68 26	46 45	318 11		342 04		235 13						
30	8 17		70 57	49 15	320 41		344 35		237 38						
40	10 47		73 27	51 45	323 11		347 05		240 03						
50	13 17		75 57	54 15	325 41		349 35		242 27						
13 00	15 47	N21 04	78 28	56 45 N 6 54	328 11	N23 31	352 06	N23 14	244 52	S 2 45	60	3 00	75	15	08 87
10	18 17		80 58	59 15	330 42		354 36		247 17			17	64	06	85
20	20 47		83 29	61 45	333 12		357 06		249 42			30	55	04	83
30	23 17		85 59	64 15	335 42		359 37		252 07			42	50	03	80
40	25 47		88 30	66 45	338 12		2 07		254 32			53	52	02	78
50	28 17		91 00	69 15	340 42		4 37		256 56			4 02	42	15	01 76
14 00	30 47	N21 05	93 30	71 45 N 6 55	343 12	N23 31	7 08	N23 14	259 21	S 2 56	45	21	36	14	58 72
10	33 17		96 01	74 15	345 42		9 38		261 46			37	32	56	69
20	35 47		98 31	76 45	348 13		12 08		264 11			4 50	29	54	66
30	38 17		101 02	79 15	350 43		14 38		266 36			5 01	27	52	64
40	40 47		103 32	81 45	353 13		17 09		269 01			21	24	49	60
50	43 17		106 02	84 15	355 43		19 39		271 26			38	23	47	56
15 00	45 47	N21 05	108 33	86 45 N 6 56	358 13	N23 31	22 09	N23 14	273 50	S 3 08	0	5 53	22	45	53
10	48 17		111 03	89 15	0 43		24 40		276 15			6 09	23	42	50
20	50 47		113 34	91 45	3 13		27 10		278 40			11 10	6 09	23	42 50
30	53 17		116 04	94 14	5 43		29 40		281 05			13 20	25	24	40 46
40	55 47		118 34	96 44	8 14		32 11		283 30			15 30	43	25	38 41
50	58 17		121 05	99 14	10 44		34 41		285 55			17 35	6 54	27	36 39
16 00	60 47	N21 06	123 35	101 44 N 6 57	13 14	N23 30	37 11	N23 14	288 19	S 3 19	40	7 07	30	34	37
10	63 17		126 06	104 14	15 44		39 42		290 44			21	45	33	32 34
20	65 47		128 36	106 44	18 14		42 12		293 09			23 50	39	37	30 30

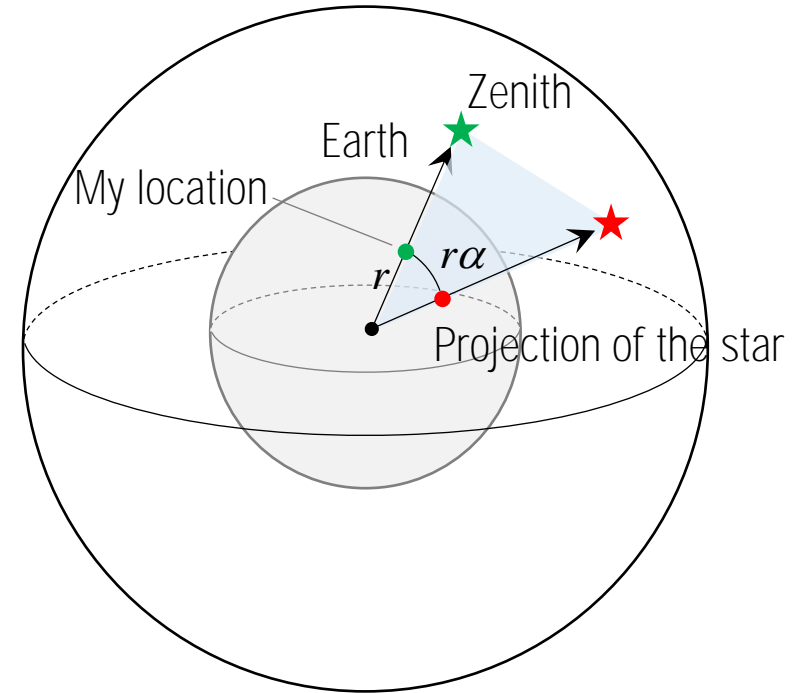


57 stars for navigation

Celestial Navigation



Far far away: point at infinity



r : radius of earth

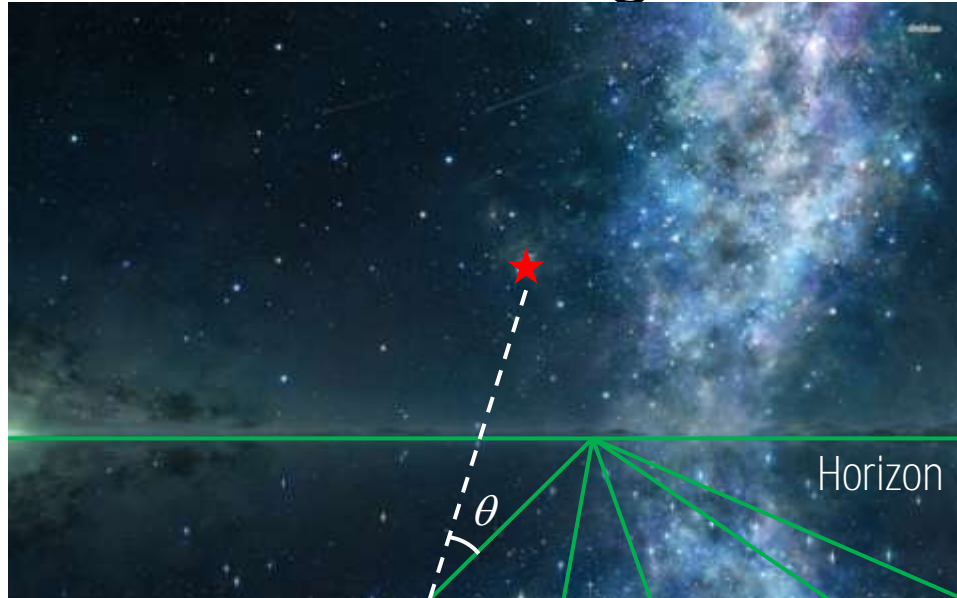
α : angle between stars

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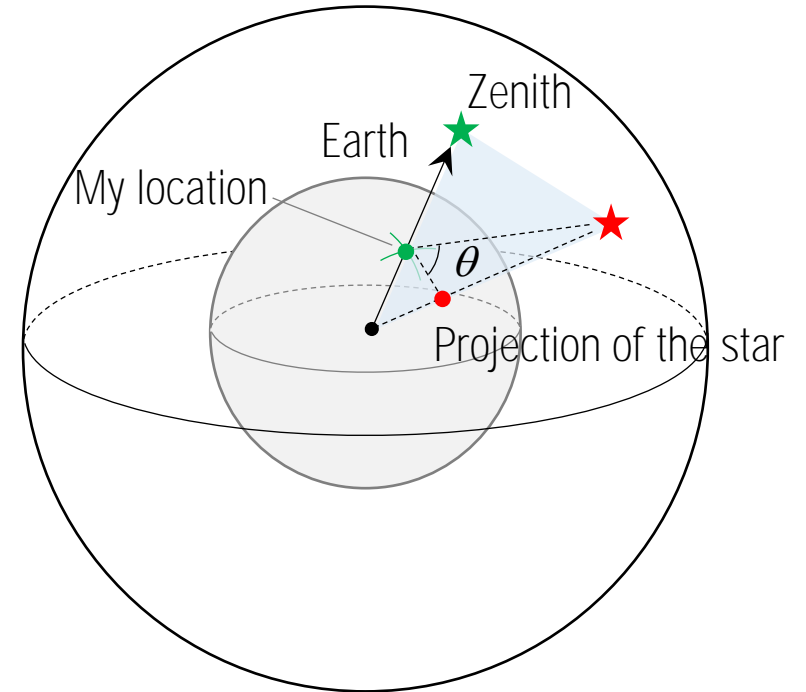
GREENWICH P. M. 1942 MAY 26 (TUESDAY)

GCT	☉ SUN		♃ VENUS-3.6		♂ MARS 1.9		♃ JUPITER-1.5		☾ MOON		Lat.	Sun-rise	Twil.	Moon-rise	Diff.
	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.					
12 00	0 47	N21 04	63 25	41 45 N 6 53	313 11	N23 31	337 04	N23 14	230 23	S 2 34					
10	3 17		65 56	44 15	315 41		339 34		232 48						
20	5 47		68 26	46 45	318 11		342 04		235 13						
30	8 17		70 57	49 15	320 41		344 35		237 38						
40	10 47		73 27	51 45	323 11		347 05		240 03						
50	13 17		75 57	54 15	325 41		349 35		242 27						
13 00	15 47	N21 04	78 28	56 45 N 6 54	328 11	N23 31	352 06	N23 14	244 52	S 2 45	60	3 00	75 15	08 87	
10	18 17		80 58	59 15	330 42		354 36		247 17						
20	20 47		83 29	61 45	333 12		357 06		249 42						
30	23 17		85 59	64 15	335 42		359 37		252 07						
40	25 47		88 30	66 45	338 12		2 07		254 32						
50	28 17		91 00	69 15	340 42		4 37		256 56						
14 00	30 47	N21 05	93 30	71 45 N 6 55	343 12	N23 31	7 08	N23 14	259 21	S 2 56	45	21 36	14 58	72	
10	33 17		96 01	74 15	345 42		9 38		261 46						
20	35 47		98 31	76 45	348 13		12 08		264 11						
30	38 17		101 02	79 15	350 43		14 38		266 36						
40	40 47		103 32	81 45	353 13		17 09		269 01						
50	43 17		106 02	84 15	355 43		19 39		271 26						
15 00	45 47	N21 05	108 33	86 45 N 6 56	358 13	N23 31	22 09	N23 14	273 50	S 3 08	0	5 53	22 45	53	
10	48 17		111 03	89 15	0 43		24 40		276 15						
20	50 47		113 34	91 45	3 13		27 10		278 40						
30	53 17		116 04	94 14	5 43		29 40		281 05						
40	55 47		118 34	96 44	8 14		32 11		283 30						
50	58 17		121 05	99 14	10 44		34 41		285 55						
16 00	60 47	N21 06	123 35	101 44 N 6 57	13 14	N23 30	37 11	N23 14	288 19	S 3 19	40	7 07	30 34	37	
10	63 17		126 06	104 14	15 44		39 42		290 44						
20	65 47		128 36	106 44	18 14		42 12		293 09						

Celestial Navigation



Far far away: point at infinity



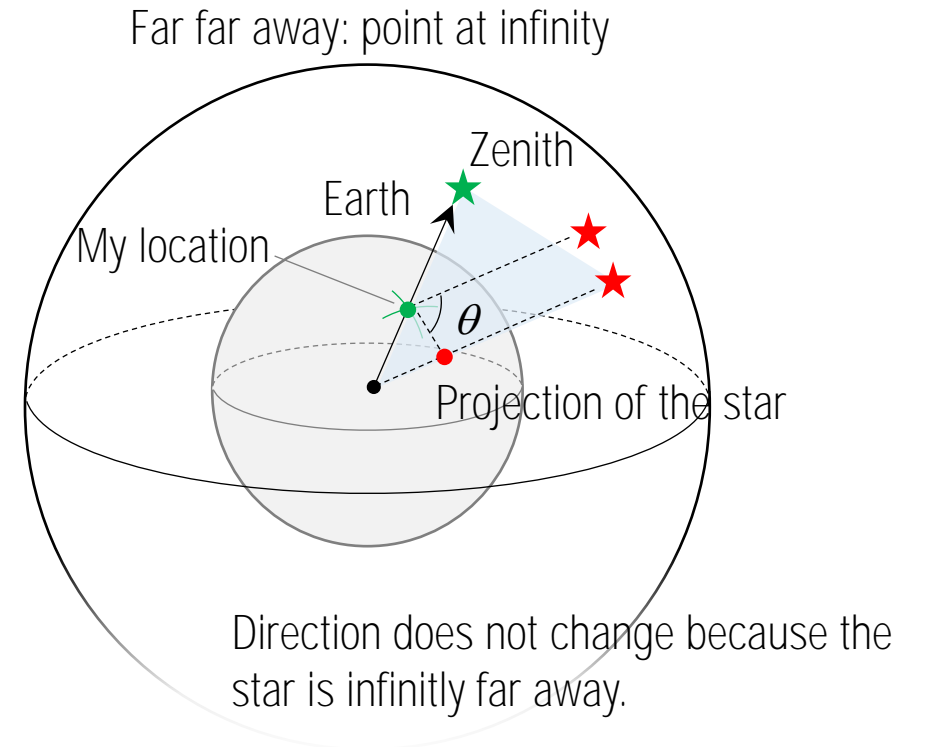
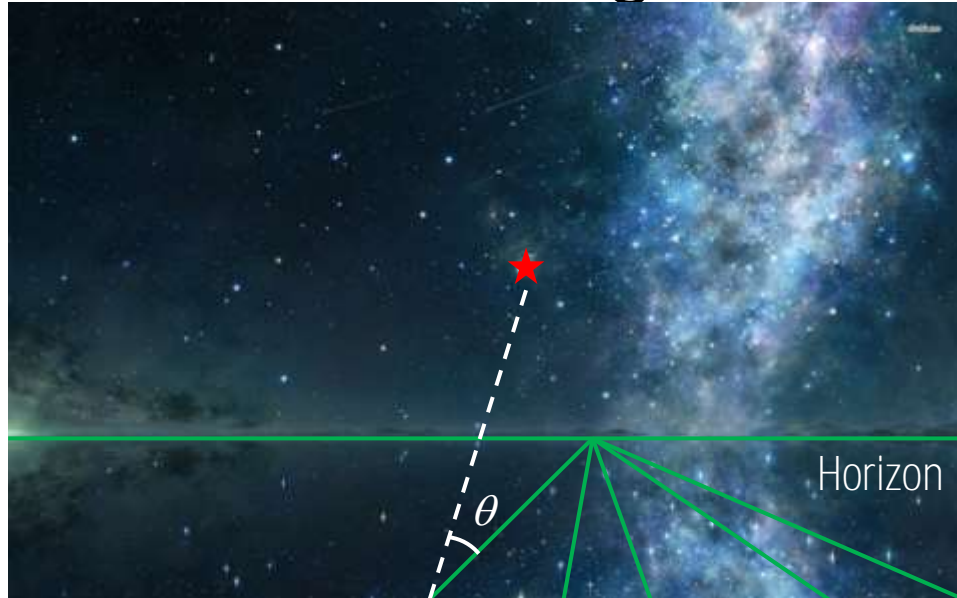
292

GREENWICH P. M. 1942 MAY 26 (TUESDAY)

GCT	☉ SUN		♃ VENUS-3.6		♂ MARS 1.9		♃ JUPITER-1.5		☾ MOON		Lat.	Sun-rise	Twil.	Moon-rise	Dif.
	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.					
12 00	0 47	N21 04	63 25	41 45 N 6 53	313 11	N23 31	337 04	N23 14	230 23	S 2 34					
10	3 17		65 56	44 15	315 41		339 34		232 48						
20	5 47		68 26	46 45	318 11		342 04		235 13						
30	8 17		70 57	49 15	320 41		344 35		237 38						
40	10 47		73 27	51 45	323 11		347 05		240 03						
50	13 17		75 57	54 15	325 41		349 35		242 27						
13 00	15 47	N21 04	78 28	56 45 N 6 54	328 11	N23 31	352 06	N23 14	244 52	S 2 45	60	3 00	75 15	08 87	
10	18 17		80 58	59 15	330 42		354 36		247 17				17 64	06 85	
20	20 47		83 29	61 45	333 12		357 06		249 42				30 55	04 83	
30	23 17		85 59	64 15	335 42		359 37		252 07				42 50	03 80	
40	25 47		88 30	66 45	338 12		2 07		254 32				53 52	02 78	
50	28 17		91 00	69 15	340 42		4 37		256 56				4 02	42 15 01 76	
14 00	30 47	N21 05	93 30	71 45 N 6 55	343 12	N23 31	7 08	N23 14	259 21	S 2 56	45	21 36	14 58 72		
10	33 17		96 01	74 15	345 42		9 38		261 46				37 32	56 69	
20	35 47		98 31	76 45	348 13		12 08		264 11				4 50	29 54 66	
30	38 17		101 02	79 15	350 43		14 38		266 36				5 01	27 52 64	
40	40 47		103 32	81 45	353 13		17 09		269 01				21 24	49 60	
50	43 17		106 02	84 15	355 43		19 39		271 26				38 23	47 56	
15 00	45 47	N21 05	108 33	86 45 N 6 56	358 13	N23 31	22 09	N23 14	273 50	S 3 08	0	5 53	22 45 53		
10	48 17		111 03	89 15	0 43		24 40		276 15						
20	50 47		113 34	91 45	3 13		27 10		278 40				6 09	23 42 50	
30	53 17		116 04	94 14	5 43		29 40		281 05				13 20	25 40 46	
40	55 47		118 34	96 44	8 14		32 11		283 30				15 30	43 25 38 41	
50	58 17		121 05	99 14	10 44		34 41		285 55				17 35	6 54 27 36 39	
16 00	60 47	N21 06	123 35	101 44 N 6 57	13 14	N23 30	37 11	N23 14	288 19	S 3 19	40	7 07	30 34 37		
10	63 17		126 06	104 14	15 44		39 42		290 44				21 45	21 33 32 34	
20	65 47		128 36	106 44	18 14		42 12		293 09				23 50	39 37 30 30	



Celestial Navigation

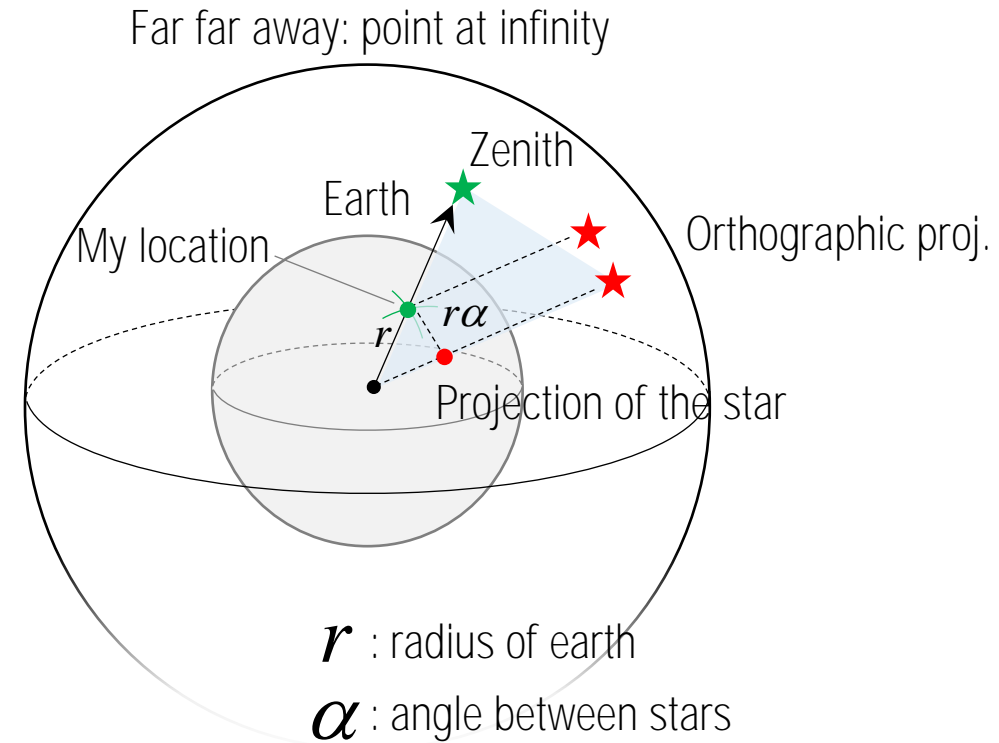
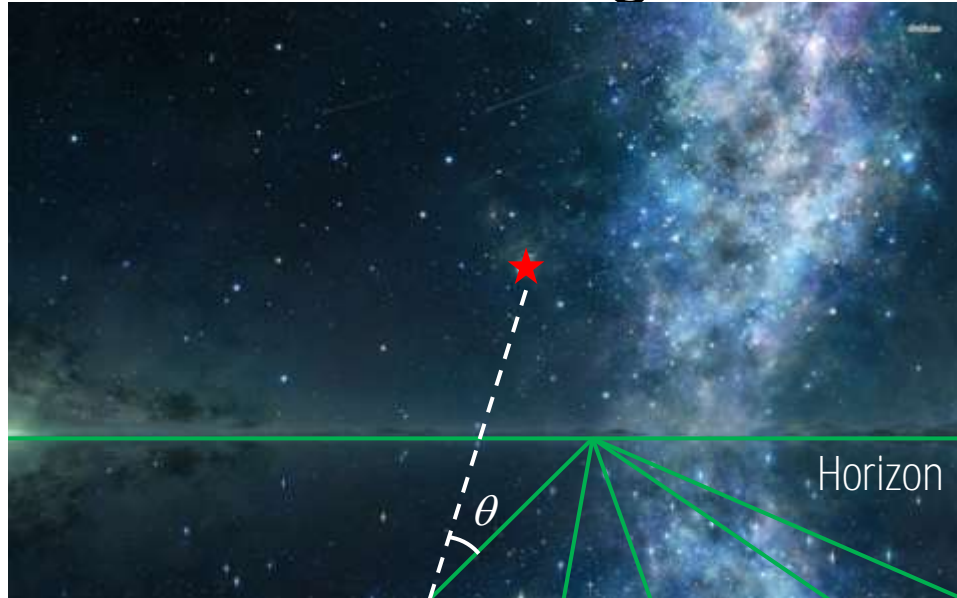


292 GREENWICH P. M. 1942 MAY 26 (TUESDAY)

GCT	☉ SUN		♃ VENUS-3.6		♂ MARS 1.9		♃ JUPITER-1.5		☾ MOON		Lat.	Sun-rise	Twil.	Moon-rise	Dif.
	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.					
12 00	0 47	N21 04	63 25	41 45 N 6 53	313 11	N23 31	337 04	N23 14	230 23	S 2 34					
10	3 17		65 56	44 15	315 41		339 34		232 48						
20	5 47		68 26	46 45	318 11		342 04		235 13						
30	8 17		70 57	49 15	320 41		344 35		237 38						
40	10 47		73 27	51 45	323 11		347 05		240 03						
50	13 17		75 57	54 15	325 41		349 35		242 27						
13 00	15 47	N21 04	78 28	56 45 N 6 54	328 11	N23 31	352 06	N23 14	244 52	S 2 45	60	3 00	75 15	08 87	
10	18 17		80 58	59 15	330 42		354 36		247 17				17 64	06 85	
20	20 47		83 29	61 45	333 12		357 06		249 42				30 55	04 83	
30	23 17		85 59	64 15	335 42		359 37		252 07				42 50	03 80	
40	25 47		88 30	66 45	338 12		2 07		254 32				53 52	02 78	
50	28 17		91 00	69 15	340 42		4 37		256 56				4 02	15 01 76	
14 00	30 47	N21 05	93 30	71 45 N 6 55	343 12	N23 31	7 08	N23 14	259 21	S 2 56	45	21 36	14 58 72		
10	33 17		96 01	74 15	345 42		9 38		261 46				37 32	56 69	
20	35 47		98 31	76 45	348 13		12 08		264 11				4 50	29 54 66	
30	38 17		101 02	79 15	350 43		14 38		266 36				5 01	27 52 64	
40	40 47		103 32	81 45	353 13		17 09		269 01				21 24	49 60	
50	43 17		106 02	84 15	355 43		19 39		271 26				38 23	47 56	
15 00	45 47	N21 05	108 33	86 45 N 6 56	358 13	N23 31	22 09	N23 14	273 50	S 3 08	0	5 53	22 45 53		
10	48 17		111 03	89 15	0 43		24 40		276 15						
20	50 47		113 34	91 45	3 13		27 10		278 40				6 09	23 42 50	
30	53 17		116 04	94 14	5 43		29 40		281 05				13 20	25 40 46	
40	55 47		118 34	96 44	8 14		32 11		283 30				15 30	43 25 38 41	
50	58 17		121 05	99 14	10 44		34 41		285 55				17 35	6 54 27 36 39	
16 00	60 47	N21 06	123 35	101 44 N 6 57	13 14	N23 30	37 11	N23 14	288 19	S 3 19	40	7 07	30 34 37		
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Celestial Navigation

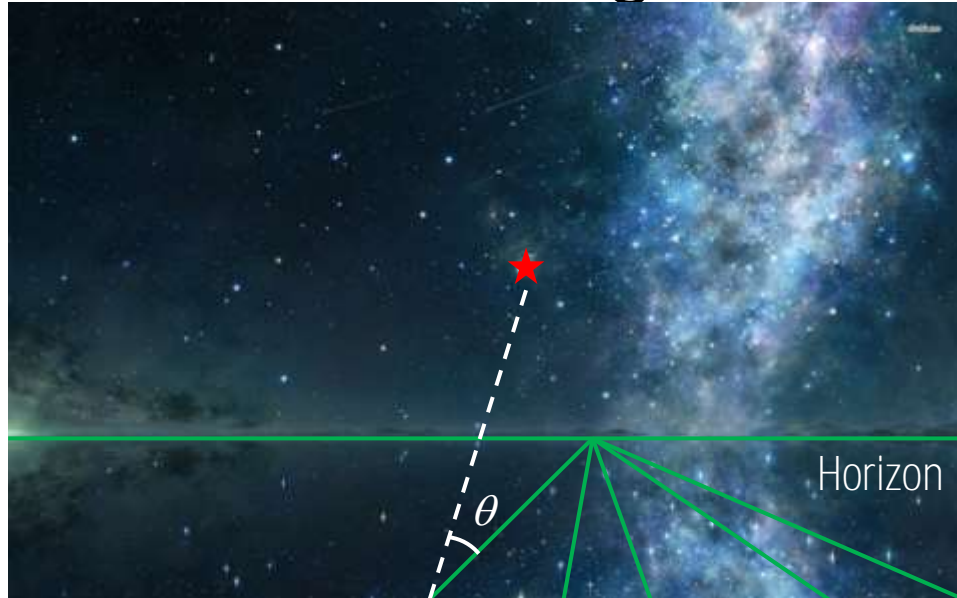


292 GREENWICH P. M. 1942 MAY 26 (TUESDAY)

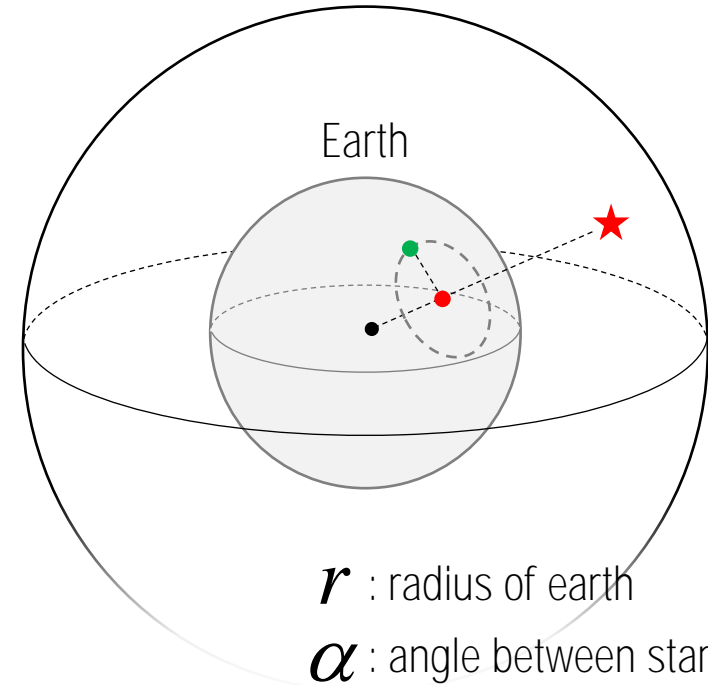
GCT	☉ SUN		♃ VENUS-3.6		♂ MARS 1.9		♃ JUPITER-1.5		☾ MOON		Lat.	Sun-rise	Twil.	Moon-rise	Dif.
	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.					
12 00	0 47	N21 04	63 25	41 45 N 6 53	313 11	N23 31	337 04	N23 14	230 23	S 2 34					
10	3 17		65 56	44 15	315 41		339 34		232 48						
20	5 47		68 26	46 45	318 11		342 04		235 13						
30	8 17		70 57	49 15	320 41		344 35		237 38						
40	10 47		73 27	51 45	323 11		347 05		240 03						
50	13 17		75 57	54 15	325 41		349 35		242 27						
13 00	15 47	N21 04	78 28	56 45 N 6 54	328 11	N23 31	352 06	N23 14	244 52	S 2 45	60	3 00	75 15	08 87	
10	18 17		80 58	59 15	330 42		354 36		247 17				17 64	06 85	
20	20 47		83 29	61 45	333 12		357 06		249 42				30 55	04 83	
30	23 17		85 59	64 15	335 42		359 37		252 07				42 50	03 80	
40	25 47		88 30	66 45	338 12		2 07		254 32				53 52	02 78	
50	28 17		91 00	69 15	340 42		4 37		256 56				4 02	15 01 76	
14 00	30 47	N21 05	93 30	71 45 N 6 55	343 12	N23 31	7 08	N23 14	259 21	S 2 56	45	21 36	14 58 72		
10	33 17		96 01	74 15	345 42		9 38		261 46				37 32	56 69	
20	35 47		98 31	76 45	348 13		12 08		264 11				4 50	29 54 66	
30	38 17		101 02	79 15	350 43		14 38		266 36				5 01	27 52 64	
40	40 47		103 32	81 45	353 13		17 09		269 01				21 24	49 60	
50	43 17		106 02	84 15	355 43		19 39		271 26				38 23	47 56	
15 00	45 47	N21 05	108 33	86 45 N 6 56	358 13	N23 31	22 09	N23 14	273 50	S 3 08	0	5 53	22 45 53		
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30	53 17		116 04	94 14	5 43		29 40		281 05				13 20	25 24 40 46	
40	55 47		118 34	96 44	8 14		32 11		283 30				15 30	43 25 38 41	
50	58 17		121 05	99 14	10 44		34 41		285 55				17 35	6 54 27 36 39	
16 00	60 47	N21 06	123 35	101 44 N 6 57	13 14	N23 30	37 11	N23 14	288 19	S 3 19	40	7 07	30 34 37		
10	63 17		126 06	104 14	15 44		39 42		290 44				21 45	21 33 32 34	
20	65 47		128 36	106 44	18 14		42 12		293 09				23 50	39 37 30 30	



Celestial Navigation



Far far away: point at infinity

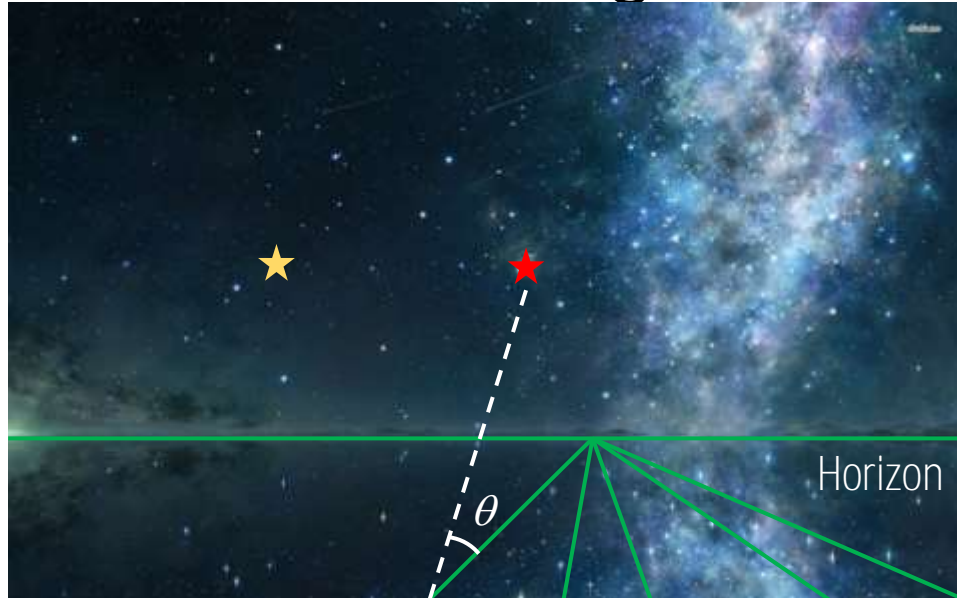


292 GREENWICH P. M. 1942 MAY 26 (TUESDAY)

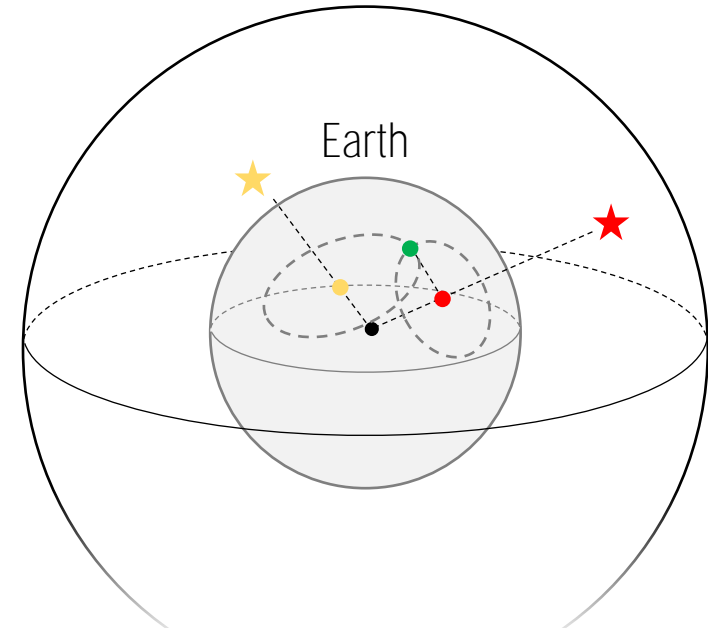
GCT	☉ SUN		♃ VENUS-3.6		♂ MARS 1.9		♃ JUPITER-1.5		☾ MOON		Lat.	Sun-rise	Twil.	Moon-rise	Dist.
	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.					
12 00	0 47	N21 04	63 25	41 45 N 6 53	313 11	N23 31	337 04	N23 14	230 23	S 2 34					
10	3 17		65 56	44 15	315 41		339 34		232 48						
20	5 47		68 26	46 45	318 11		342 04		235 13						
30	8 17		70 57	49 15	320 41		344 35		237 38						
40	10 47		73 27	51 45	323 11		347 05		240 03						
50	13 17		75 57	54 15	325 41		349 35		242 27						
13 00	15 47	N21 04	78 28	56 45 N 6 54	328 11	N23 31	352 06	N23 14	244 52	S 2 45	60	3 00	75 15	08 87	
10	18 17		80 58	59 15	330 42		354 36		247 17			17 64	06 85		
20	20 47		83 29	61 45	333 12		357 06		249 42			30 55	04 83		
30	23 17		85 59	64 15	335 42		359 37		252 07			42 50	03 80		
40	25 47		88 30	66 45	338 12		2 07		254 32			53 52	02 78		
50	28 17		91 00	69 15	340 42		4 37		256 56			4 02	15 01 76		
14 00	30 47	N21 05	93 30	71 45 N 6 55	343 12	N23 31	7 08	N23 14	259 21	S 2 56	45	21 36	14 58 72		
10	33 17		96 01	74 15	345 42		9 38		261 46			37 32	56 69		
20	35 47		98 31	76 45	348 13		12 08		264 11			4 50	29 54 66		
30	38 17		101 02	79 15	350 43		14 38		266 36			5 01	27 52 64		
40	40 47		103 32	81 45	353 13		17 09		269 01			21 24	49 60		
50	43 17		106 02	84 15	355 43		19 39		271 26			38 23	47 56		
15 00	45 47	N21 05	108 33	86 45 N 6 56	358 13	N23 31	22 09	N23 14	273 50	S 3 08	0	5 53	22 45 53		
10	48 17		111 03	89 15	0 43		24 40		276 15						
20	50 47		113 34	91 45	3 13		27 10		278 40			6 09	23 42 50		
30	53 17		116 04	94 14	5 43		29 40		281 05			13 20	25 24 40 46		
40	55 47		118 34	96 44	8 14		32 11		283 30			15 30	43 25 38 41		
50	58 17		121 05	99 14	10 44		34 41		285 55			17 35	6 54 27 36 39		
16 00	60 47	N21 06	123 35	101 44 N 6 57	13 14	N23 30	37 11	N23 14	288 19	S 3 19	40	7 07	30 34 37		
10	63 17		126 06	104 14	15 44		39 42		290 44			21 45	21 33 32 34		
20	65 47		128 36	106 44	18 14		42 12		293 09			23 50	39 37 30 30		



Celestial Navigation



Far far away: point at infinity



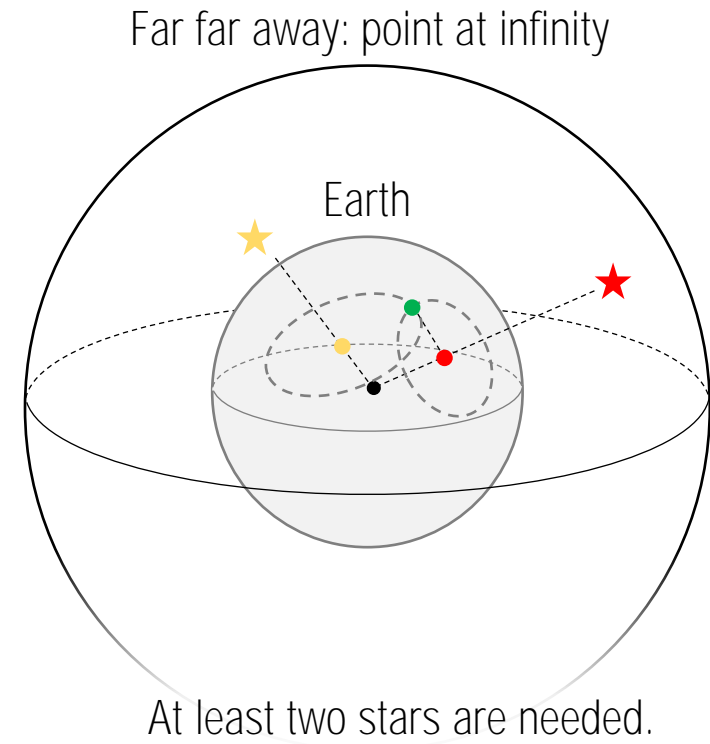
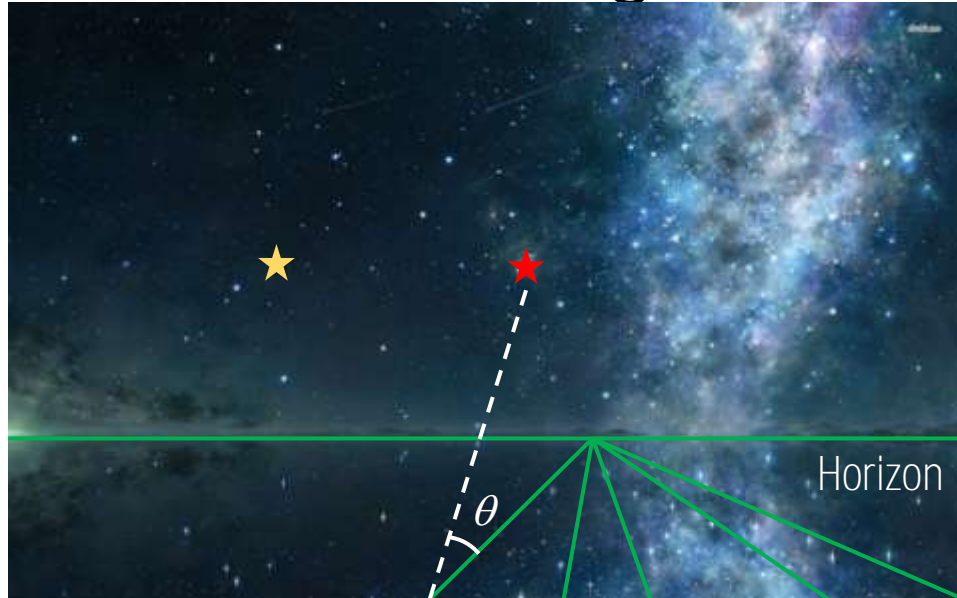
At least two stars are needed.

292 GREENWICH P. M. 1942 MAY 26 (TUESDAY)

GCT	☉ SUN		♃ VENUS-3.6		♂ MARS 1.9		♃ JUPITER-1.5		☾ MOON		Lat.	Sun-rise	Twil.	Moon-rise	Dist.
	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.	GHA	Dec.					
12 00	0 47	N21 04	63 25	41 45 N 6 53	313 11	N23 31	337 04	N23 14	230 23	S 2 34					
10	3 17		65 56	44 15	315 41		339 34		232 48						
20	5 47		68 26	46 45	318 11		342 04		235 13						
30	8 17		70 57	49 15	320 41		344 35		237 38						
40	10 47		73 27	51 45	323 11		347 05		240 03						
50	13 17		75 57	54 15	325 41		349 35		242 27						
13 00	15 47	N21 04	78 28	56 45 N 6 54	328 11	N23 31	352 06	N23 14	244 52	S 2 45	60	3 00	75 15	08 87	
10	18 17		80 58	59 15	330 42		354 36		247 17						
20	20 47		83 29	61 45	333 12		357 06		249 42						
30	23 17		85 59	64 15	335 42		359 37		252 07						
40	25 47		88 30	66 45	338 12		2 07		254 32						
50	28 17		91 00	69 15	340 42		4 37		256 56						
14 00	30 47	N21 05	93 30	71 45 N 6 55	343 12	N23 31	7 08	N23 14	259 21	S 2 56	45	21 36	14 58	72	
10	33 17		96 01	74 15	345 42		9 38		261 46						
20	35 47		98 31	76 45	348 13		12 08		264 11						
30	38 17		101 02	79 15	350 43		14 38		266 36						
40	40 47		103 32	81 45	353 13		17 09		269 01						
50	43 17		106 02	84 15	355 43		19 39		271 26						
15 00	45 47	N21 05	108 33	86 45 N 6 56	358 13	N23 31	22 09	N23 14	273 50	S 3 08	0	5 53	22 45	53	
10	48 17		111 03	89 15	0 43		24 40		276 15						
20	50 47		113 34	91 45	3 13		27 10		278 40						
30	53 17		116 04	94 14	5 43		29 40		281 05						
40	55 47		118 34	96 44	8 14		32 11		283 30						
50	58 17		121 05	99 14	10 44		34 41		285 55						
16 00	60 47	N21 06	123 35	101 44 N 6 57	13 14	N23 30	37 11	N23 14	288 19	S 3 19	40	7 07	30 34	37	
10	63 17		126 06	104 14	15 44		39 42		290 44						
20	65 47		128 36	106 44	18 14		42 12		293 09						



Celestial Navigation



Two points at infinity (vanishing points) tells us about where I am.