

Star Identification Problems

- The Starfinder (2102-D) is an instrument used for identifying stars and planets based on their azimuth (bearing) and altitude (height).
- The key to star identification problems is three-fold:
 - Use the correct hemisphere on the backing plate (North or South)
 - Use the correct plate based on latitude (all USCG Problems use the 25° plate).
 - Find the LHA of Aries (based on the GHA of Aries and your DR longitude).
- The vast majority of problems on USCG exams are of major navigational stars. However, there are some problems in the database seeking minor stars. For these minor star problems, the procedure is the same but requires an extra step at the end of looking up the star's right ascension (RA) and declination (dec) in the back of the Nautical Almanac.

SID D1. On 17 March your 1845 DR position is latitude 25° 10.0' N, longitude 66° 48.0' W. You observe an unidentified star bearing 320° T at an observed altitude (ho) of 50° 02.9'. The chronometer reads 10h 47m 49s and is 1m 54s fast. What star did you observe?

Answer: Mirfak.

Step 1: Determine the correct chronometer time of the sight.

Chronometer: 10h 47m 49s

Chronometer error: 1m 54s fast

Correct chronometer time: 10:47:49 – 00:01:54 = 10:45:55

Step 2: Determine the GMT of the sight.

Chronometer: 10h 45m 55s

1845 ZT DR Longitude: 66° 48.0' W corresponds to (+4 ZD)

GMT of sight: 22:45:55

Step 3: Determine the GHA of Aries for the time of the sight.

GHA Aries (hours): 145° 23.1'

GHA Aries (increment): 11° 30.6'

GHA Aries (Total): 145° 23.1' + 11° 30.6' = 156° 53.7'

Step 4: Determine the LHA of Aries for the time of the sight.

GHA Aries: 156° 53.7'

DR Longitude: 66° 48.0' W (W longitude subtract, E longitude add)

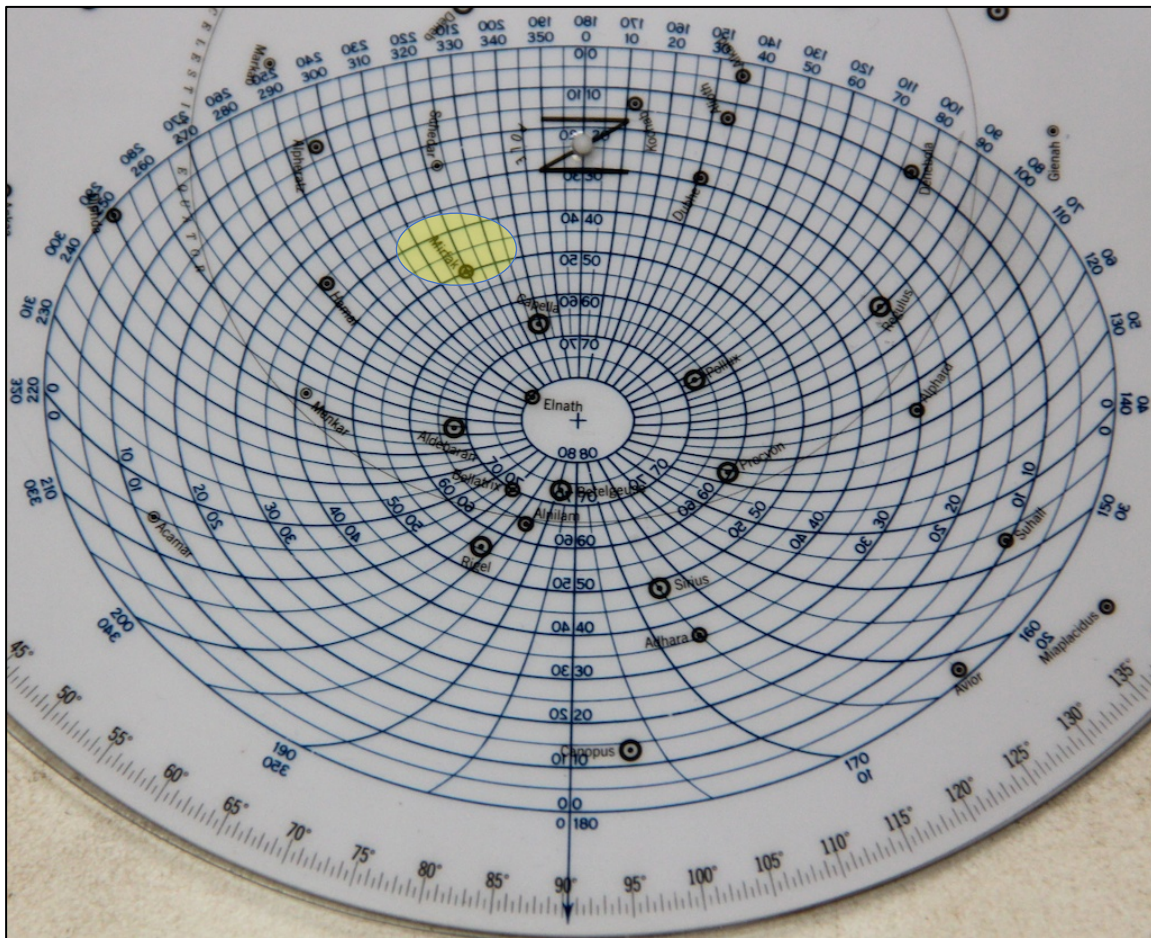
LHA Aries: 156° 53.7' – 66° 48.0' W = 90° 05.7'

G.M.T.		ARIES	
		G.	H.A.
17	00	174	28.8
	01	189	31.3
	02	204	33.8
	03	219	36.2
	04	234	38.7
	05	249	41.2
	06	264	43.6
	07	279	46.1
	08	294	48.6
	09	309	51.0
	10	324	53.5
	11	339	55.9
	12	354	58.4
	13	10	00.9
	14	25	03.3
	15	40	05.8
	16	55	08.3
	17	70	10.7
	18	85	13.2
	19	100	15.7
	20	115	18.1
	21	130	20.6
	22	145	23.1
	23	160	25.5

m	SUN	ARIES
	PLANETS	
45		
55	11 28.8	11 30.6
56	11 29.0	11 30.9
57	11 29.3	11 31.1
58	11 29.5	11 31.4
59	11 29.8	11 31.6

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- Step 5: Set up the Starfinder.
LHA Aries: $90^{\circ} 05.7'$
Observer's Latitude (nearest incremental degree): 25° N
- Step 6: Search the Starfinder field based on the given altitude and azimuth.
Observed altitude (h_o): $50^{\circ} 02.9'$
Observed azimuth: 320° T
- Step 7: Identify the observed body.
Mirfak is the closest body to the observed altitude and azimuth.



Star Identification Problems

SID D2. On 23 September, while taking stars for an evening fix, an unidentified star is observed bearing 261° T at an observed altitude (ho) of $61^\circ 35'$. Your 1836 zone time DR position is latitude $25^\circ 18'$ S, longitude $162^\circ 36'$ E. The chronometer reads 07h 34m 12s, and the chronometer error is 1m 54s slow. Your vessel is steaming on a course of 230° T at a speed of 18 knots. What star did you observe?

Answer: Antares.

Step 1: Determine the correct chronometer time of the sight.
 Chronometer: 7h 34m 12s
 Chronometer error: 1m 54s slow
 Correct chronometer time: $07:34:12 + 00:01:54 = 07:36:06$

23	00	1 45.2
	01	16 47.6
	02	31 50.1
	03	46 52.6
	04	61 55.0
	05	76 57.5
	06	92 00.0
	07	107 02.4
W	08	122 04.9
E	09	137 07.4
D	10	152 09.8
N	11	167 12.3
E	12	182 14.7
S	13	197 17.2
D	14	212 19.7
A	15	227 22.1
Y	16	242 24.6
	17	257 27.1
	18	272 29.5
	19	287 32.0
	20	302 34.5
	21	317 36.9
	22	332 39.4
	23	347 41.9

Step 2: Determine the GMT of the sight.
 Chronometer: 07h 36m 06s
 1836 ZT DR Longitude: $162^\circ 36.0'$ E corresponds to (-11 ZD)
 GMT of sight: 07:36:06

Step 3: Determine the GHA of Aries for the time of the sight.
 GHA Aries (hours): $107^\circ 02.4'$
 GHA Aries (increment): $9^\circ 03.0'$
 GHA Aries (Total): $107^\circ 02.4' + 9^\circ 03.0' = 116^\circ 05.4'$

Step 4: Determine the LHA of Aries for the time of the sight.
 GHA Aries: $116^\circ 05.4'$
 DR Longitude: $162^\circ 36.0'$ E (E longitude add, W longitude subtract)
 LHA Aries: $116^\circ 05.4' + 162^\circ 36.0' W = \underline{278^\circ 41.4'}$

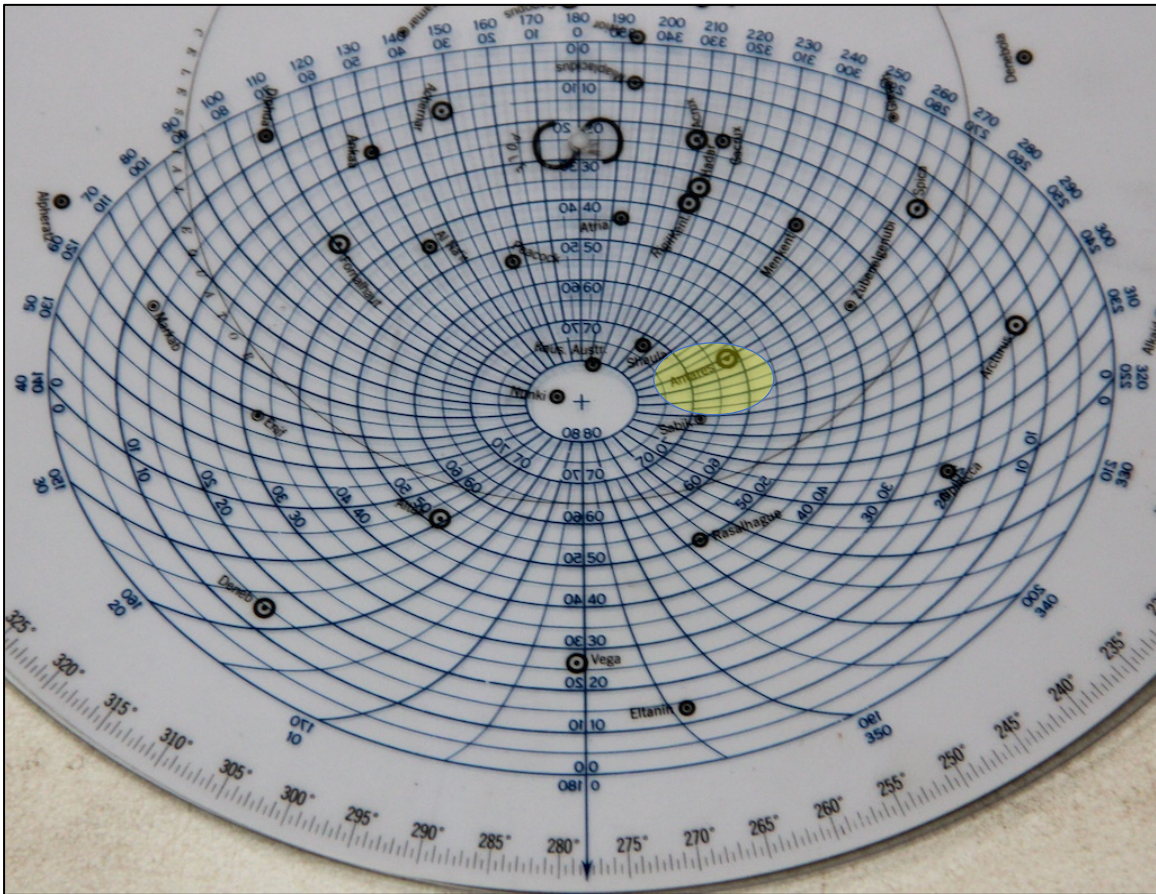
^m 36	SUN PLANETS	ARIES
5	'	'
00	9 00-0	9 01-5
01	9 00-3	9 01-7
02	9 00-5	9 02-0
03	9 00-8	9 02-2
04	9 01-0	9 02-5
05	9 01-3	9 02-7
06	9 01-5	9 03-0
07	9 01-8	9 03-2
08	9 02-0	9 03-5
09	9 02-3	9 03-7

Step 5: Set up the Starfinder.
 LHA Aries: $278^\circ 41.4'$
 Observer's Latitude (nearest incremental degree): 25° S

Step 6: Search the Starfinder field based on the given altitude and azimuth.
 Observed altitude (ho): $61^\circ 35.0'$
 Observed azimuth: 261° T

Step 7: Identify the observed body.
Antares is the closest body to the observed altitude and azimuth.

Star Identification Problems



Star Identification Problems

SID D3. On 12 June 1981, your DR 1845 position is LAT $21^{\circ} 47' N$, LONG $46^{\circ} 52' W$ when you observe a faint unidentifiable star through a break in the clouds. The star bears $313^{\circ} T$ at a sextant altitude (Hs) of $14^{\circ} 56.3'$. The index error is $0.5'$ on the arc and the height of eye is 45 feet. The chronometer reads 09:43:27 and the chronometer error is 1m 46s slow. What star did you observe?

Answer: Menkalinan (Minor Star)

- Step 1: Determine the correct chronometer time of the sight.
 Chronometer: 9h 43m 27s
 Chronometer error: 1m 46s slow
 Correct chronometer time: 09:45:13
- Step 2: Determine the GMT of the sight.
 1845 ZT DR Longitude: $46^{\circ} 52' W$ corresponds to (+3 ZD)
 GMT of sight: 21:45:13
- Step 3: Determine the GHA of Aries for the time of the sight.
 GHA Aries (hours): $216^{\circ} 05.6'$
 GHA Aries (increment): $11^{\circ} 20.1'$
 GHA Aries (Total): $227^{\circ} 25.7'$
- Step 4: Determine the LHA of Aries for the time of the sight.
 GHA Aries: $227^{\circ} 25.7'$
 DR Longitude: $46^{\circ} 52' W$ (E longitude add, W longitude subtract)
 LHA Aries: $180^{\circ} 33.7'$
- Step 5: Set up the Starfinder.
 LHA Aries: $180^{\circ} 33.7'$
 Observer's Latitude (nearest incremental degree): $25^{\circ} S$
- Step 6: Determine the Height Observed (Ho) by applying index error, height of eye and apparent altitude corrections.

$$\begin{aligned} H_s &= 14^{\circ} 56.3' \\ IC &= +0.5' \\ Dip &= -6.5' \\ \underline{H_a} &= \underline{14^{\circ} 50.3'} \\ Alt\ Corr &= -3.6' \\ \underline{H_o} &= \underline{14^{\circ} 46.7'} \end{aligned}$$

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G.M.T.	ARIES		λ
	G.H.A.	λ	
12 00	260 13.9	16	
01	275 16.4	17	
02	290 18.8	18	
03	305 21.3	20	
04	320 23.8	22	
05	335 26.2	23	
06	350 28.7	25	
07	5 31.1	26	
08	20 33.6	28	
F 09	35 36.1	29	
R 10	50 38.5	31	
I 11	65 41.0	32	
D 12	80 43.5	34	
A 13	95 45.9	35	
Y 14	110 48.4	1	
15	125 50.9	2	
16	140 53.3	4	
17	155 55.8	5	
18	170 58.3	7	
19	186 00.7	8	
20	201 03.2	10	
21	216 05.6	11	
22	231 08.1	13	
23	246 10.6	14	

m	SUN PLANETS	
	°	'
45	11	15-0
00	11	15-3
01	11	15-5
02	11	15-8
03	11	16-0
04	11	16-3
05	11	16-5
06	11	16-8
07	11	17-0
08	11	17-3
09	11	17-5
10	11	17-8
11	11	18-0
12	11	18-3
13	11	18-5
14	11	18-5

Star Identification Problems

- Step 7: Make a mark on the Starfinder plate at the appropriate Ho and Azimuth.
Observed altitude (ho): $14^{\circ} 46.7'$
Observed azimuth: $313^{\circ} T$
- Step 8: Find the Right Ascension and Declination of the body.
Put the red template on the Starfinder.
Align 0° line with mark you made in Step 8.
RA is the outer number on the Starfinder = 87°
Declination is based on location on the red plate = $45^{\circ} N$
- Step 9: Find the SHA.
 $SHA = 360 - RA = 273^{\circ}$
- Step 10: Look in the back of the Nautical Almanac for the best match (note more accuracy can be obtained by averaging the 25° and 15° plate, which is rarely necessary to answer the exam question).
B Auriga, or Menkalinan.

