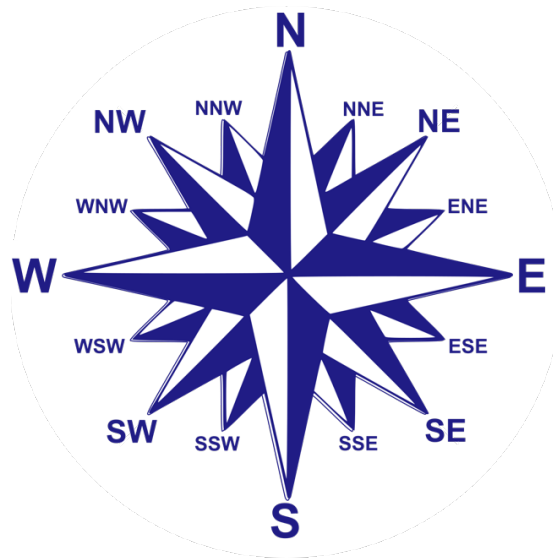


Stars and Compass 2020



Introduction

The Stars and Compass trophy has been donated for annual competition with a view to maintaining an interest in traditional methods of navigation.

No answers are to include the use of modern computer-based devices such as GPS or software such as Navionics chart software.

General Instructions

Please;

- Number all of your pages and ensure that your name is also on each page
- Show all calculations
- Provide copies of any plots and illustrations, with appropriate notations that you use in preparing your answers
- Make explicit any assumptions that you have used
- Begin each main question on a new sheet
- Sub-questions such as 1(a), 1(b) for example should start on a new line
- If your answers are prepared on a computer then use at least 1.5 line spacing and a 10 point font or larger
- Enjoy the challenge

Notes

1. Access to charts AUS 143 (Section 2) and AUS 154 (Section 4) will be required
2. The BOM/AHO tide tables are to be used as necessary. They are available on the BOM website and AHO publications. Tide data used should be detailed in your answer
3. Deviation table, speed polars, ephemeris data, increments & corrections and MSLP charts are all provided as attachments

Instructions for submitting your paper in 2020

All entries must be submitted to the RBYC office by the close of business on Thursday, 18th June, 2020 with the winner presented with the trophy at Presentation Night, whenever that will be or in whatever form it will take in light of the current situation.

There are a number of ways to submit a paper this year.

- You must include a cover sheet with your name, address, email address and phone number
- Scan it and email to the RBYC Sailing Office - sailing@rbyc.org.au
- Posted to RBYC - Addressed - Stars and Compass,
Royal Brighton Yacht Club,
253 Esplanade,
Middle Brighton, VIC 3186
- Drop it off, in an envelope addressed to Stars and Compass, to the RBYC restaurant during opening hours. Please check the website for the opening hours as they change.




Please email Robina Smith, robina_smith@hotmail.com when you have submitted a paper so that we can ensure all papers have been collected for marking.

2020 Stars & Compass

1. Who am I?

- 1.1 John William Norie [1]
- 1.2 Marc St Hilaire [1]
- 1.3 C.H.D. Buys Ballot [2]
- 1.4 Roy Stanbrook [2]
- 1.5 Roderick Nairn [3]

2. General Navigation

- 2.1 Box the compass from North to East [2]
- 2.2 What are the following mnemonics used for;
 - a. True virgins make dull company [1]
 - b. Cadet [1]
- 2.3 How can you find your position with a sextant without using any celestial objects or the horizon? [2]
(Hint: you'll need one of these) 
- 2.4 What is blind pilotage? [2]
- 2.5 What are advance and transfer? [2]
- 2.6 What is the meaning of a yellow signal flag flown by a ship entering harbour? [1]
- 2.7 What is High Water Full and Change? [2]
- 2.8 What is the meaning of this buoy?  [4]
- 2.9 You are approaching the entrance to Port Phillip from the south-east in very good visibility.
 - At 0200 local you are in position 130°M/22.9Nm from Pt Lonsdale light
 - At 0215 you are in position 130°M/21.4N
- a. If your height of eye is 9ft, at what time will you raise Pt Lonsdale light? [2]
- b. What is the significance of this signal displayed at night by the Pt Lonsdale Lighthouse?  [3]
- 2.10 You are following *Tasmanian Achiever* inbound up the Williamstown Channel. With Pt Gellibrand abeam, she makes the following sound signal; one long blast, followed by four short blasts. What does this signify? [3]

3. Chartwork (AUS 158)

- 3.1 What is the usual projection of a large-scale chart? [1]

- 3.2 What projection allows great circle tracks to be drawn as straight lines? [2]
- 3.3 How is a nautical mile defined? [1]
- 3.4 What is the ZOC of the southern part of Swan Bay? [1]
- 3.5 What are the characteristics of the light in position 38° 16.6'S, 144° 37.1'E [3]
- 3.6 What is meaning of the chart symbols in the following positions;
- a. 38° 20.2'S, 144° 35.1'E [2]
 - b. 38° 14.3'S, 144° 43.9'E [2]
 - c. 38° 15.2'S, 144° 44.6'E [2]
 - d. 38° 18.2'S, 144° 41.7'E [2]
- 3.7 You are making a passage from the northern end of Pinnacle Ch to Safety Beach boat harbour. At 1430, while steering 096°M, you take the following compass fix;
- | | |
|-----------------------|------|
| Sth Channel No. 24 Bn | 122° |
| Sth Channel No. 14 Bn | 171° |
| RHE Sth Channel Fort | 225° |
- a. Using the Deviation table at Attachment 1, what is;
 - i. The Lat/Long of this position [2]
 - ii. the chart symbol at this position? [1]
 - b. If the flood tide is setting 030/1.5kts, and you are making 6 kts through the water;
 - i. what course should you steer to make the boat harbour entrance [2]
 - ii. what is your ETA? [2]
- 3.8 The High Light on Shortland Bluff (38° 16.3'S, 144° 39.7'E) has an unusual characteristic which is shared by only two other lighthouses in the world. What is it? [3]

4. Tides

- 4.1 A navigation beacon with a charted height of 8m is located on a sandbank which is shown drying 2m. If MHWS is 6m, what is the height of the beacon above the sand? Provide a diagram to explain your answer. [3]
- 4.2 What is the clearance under the Westgate Bridge at 19:00 AEST on 30 June 2020. Provide a diagram. [2]

5. Passage Planning

Prepare a passage plan from RBYC to Grassy on King Island. The trip need not be continuous, but it must be undertaken between 08:00 10 April and 16:00 19 April 2020. Your answer must include the expected tidal set and rate when transiting the Rip, and a weather forecast for the passage across Bass Strait. Speed polars and synoptic charts for the period are provided as attachments. [10]

6. Communications

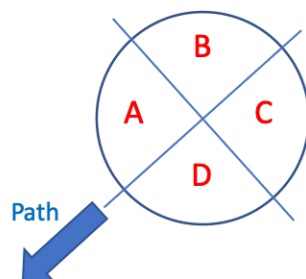
- 6.1 What VHF channel would you use to call Lonsdale VTS? [2]
- 6.2 What is the frequency of an EPIRB [2]
- 6.3 a. What qualification do you need to operate a VHF radio? [2]
b. Do you have one? [Yes=1, No=0]
- 6.4 What qualification is needed to operate a radio exclusively in the 27MHz marine band? [3]
- 6.5 International regulations no longer require silence periods to be observed on distress and calling frequencies, however, in Australia they should still be observed. When are the radiotelephony silence periods? [2]
- 6.6 What are the distress frequencies in Australian waters? [7]

7. Bar Crossing

- 7.1 What precautions would you take prior to crossing the Lakes Entrance bar? [6]
- 7.2 During what period on 30th June 2020 would you plan to cross the bar, assuming weather conditions were suitable? [2]
- 7.3 What aids to navigation have been provided by Gippsland Ports to facilitate the safe passage of the bar? [2]
- 7.4 How is closure of the bar signalled? [2]

8. Tropical Revolving Storms

This diagram represents a tropical cyclone in the southern hemisphere

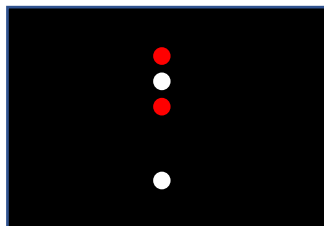


- 8.1 Which two quadrants are the navigable semicircle? [2]
- 8.2 Which is the dangerous quadrant? [2]

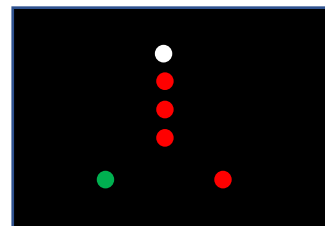
- 8.3 What course, relative to the prevailing wind, would you steer if you were in quadrant A? [3]
- 8.4 If you were in Quadrant D? [3]

9. International Regulations for Preventing Collisions at Sea

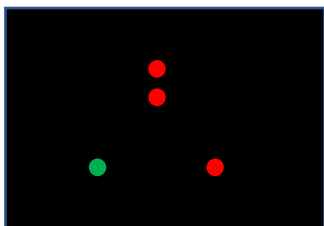
- 9.1 In what circumstances do the Rules apply? [2]
- 9.2 When two power-driven vessels in sight of one another are meeting on reciprocal or nearly reciprocal courses, what action shall each take to avoid a collision? [2]
- 9.3 In the following situations, which vessel is required to keep out of the way of the other;
- A vessel engaged in fishing AND a vessel restricted in her ability to manoeuvre [2]
 - A vessel constrained by her draught AND a vessel restricted in her ability to manoeuvre [2]
 - A sailing vessel AND a vessel engaged in fishing [2]
 - A sailing vessel AND a vessel which can safely navigate only within a narrow channel [2]
- 9.4 In the following situations, under which circumstances should a power-driven vessel not alter course to port;
- The stand-on vessel in a crossing situation when in sight of each other [3]
 - In restricted visibility, when another vessel is detected by radar alone, and a close quarters situation is developing [3]
- 9.5 What vessels are identified by the following lights? Include any relevant lengths or vessel aspects (n.b. iv has at least five correct answers);



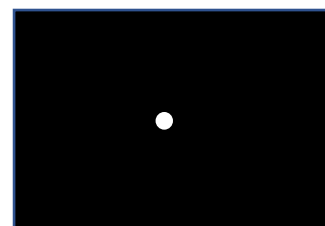
i. [2]



ii. [2]



iii. [2]



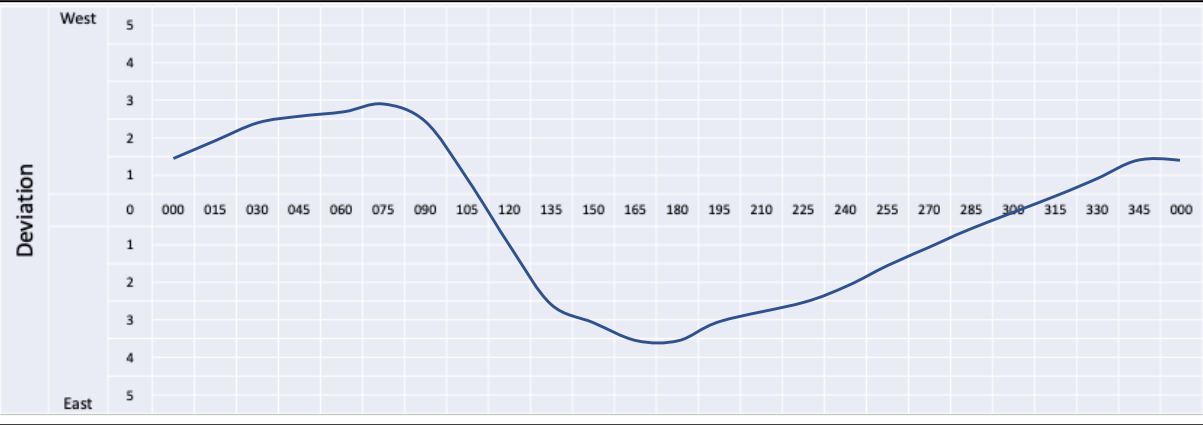
iv. [5]

10. Astro Navigation

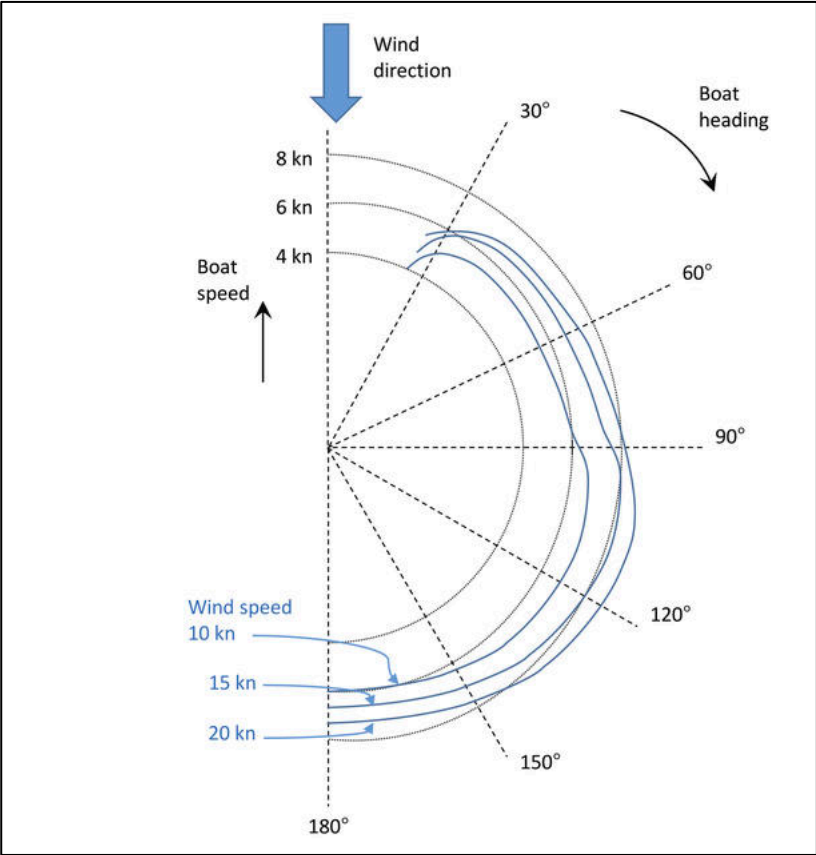
Rigel Kentaurus is the third brightest navigation star;

- 10.1 By what name is it more commonly known? [2]
(Hint: *Rigel Kent.* is not the answer)
- 10.2 In which constellation is it located? [2]
- 10.3 If it passed over your zenith, what would your latitude be? [2]
- 10.4 If it crossed your meridian to the south, and its corrected sextant altitude was $67^{\circ} 04.7'$, what would your latitude be? [2]
- 10.5 If it crossed your meridian at 1025:50s UTC on 30th June 2020, what would your longitude be? [4]
- 10.6 While preparing to shoot morning stars, you drop your sextant. It appears undamaged, but you suspect that the index error will have been affected. How can you mitigate the effect of an unknown index error? [3]

Attachment 1: Deviation Table



Attachment 2: Speed Polar Diagram



Attachment 3: Ephemerides

June 29, 30, 01 (Mon., Tue., Wed.)

Aries				Venus				Mars				Jupiter				Saturn				Stars			
Mon	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec	SHA	Dec				
0	277°32.0	213°07.1	N17°20.9	276°38.6	S20°36.2	341°19.4	S21°32.8	335°06.1	S20°18.0									Alpheratz	357°38.5	27°32.0			
1	292°34.5	228°09.2	20.8	290°46.6	35.8	356°22.1	32.8	350°08.8	18.0									Ankaa	353°10.8	-42°11.5			
2	307°37.0	243°11.2	20.6	305°49.7	35.2	11°24.9	32.9	5°11.4	18.1									Schedar	349°35.1	56°38.6			
3	322°39.4	258°13.3	20.5	320°50.7	34.7	26°27.7	32.9	20°14.0	18.1									Polaris	315°58.0	-17°22.5			
4	337°41.9	273°15.4	20.4	335°51.8	34.1	31°30.5	33.0	25°16.7	18.2									Achernar	335°23.3	-57°07.8			
5	352°44.4	288°17.4	20.2	350°52.8	33.6	36°33.2	33.0	30°19.3	18.2									Hamal	327°55.5	23°33.3			
6	7°46.8	303°19.5	N17°20.1	5°53.9	S20°33.1	71°36.0	S21°33.1	65°21.9	S20°18.2									Polaris	315°58.0	89°20.6			
7	22°49.3	318°21.5	20.0	20°55.0	32.5	86°38.8	33.2	80°24.6	18.3									Akamari	315°14.9	-40°13.3			
8	37°51.8	333°23.6	19.8	35°56.0	32.0	101°41.6	33.2	95°27.2	18.3									Menkar	314°10.2	4°10.1			
9	52°54.2	348°25.6	19.7	50°57.1	31.4	116°44.3	33.3	110°29.8	18.4									Miraf	308°33.8	49°55.7			
10	67°56.7	3°27.2	19.5	65°58.1	30.9	131°47.1	33.3	125°32.5	18.4									Aldebaran	280°44.1	16°32.9			
11	82°59.1	18°29.7	19.4	80°59.2	30.3	146°49.9	33.4	140°35.1	18.4									Rigel	281°07.7	-8°10.8			
12	98°01.6	33°31.7	N17°19.3	96°00.3	S20°29.8	161°52.7	S21°33.5	155°37.7	S20°18.5									Capella	280°27.8	46°01.0			
13	113°04.1	48°33.7	19.2	111°01.3	29.3	176°55.4	33.5	170°40.4	18.5									Bellatrix	278°27.1	6°22.0			
14	128°06.5	63°35.8	19.0	126°02.4	28.7	191°58.2	33.6	185°43.0	18.5									Elath	278°06.9	28°37.3			
15	143°09.0	78°37.8	18.9	141°03.4	28.2	207°01.0	33.6	200°45.6	18.6									Benegeuse	270°56.4	7°24.6			
16	158°11.5	93°39.8	18.8	156°04.5	27.6	222°03.8	33.7	215°48.3	18.6									Canopus	263°54.6	-52°42.4			
17	173°13.9	108°41.8	18.7	171°06.6	27.1	237°06.6	33.7	230°50.9	18.7									Sirius	258°29.7	-16°44.5			
18	188°16.4	123°43.8	N17°18.5	186°06.6	S20°26.6	252°09.3	S21°33.8	245°53.5	S20°18.7									Adara	255°09.1	-29°00.1			
19	203°18.9	138°45.8	18.4	201°07.7	26.0	267°12.1	33.9	260°56.2	18.7									Procyon	244°54.9	5°10.5			
20	218°21.3	153°47.8	18.3	216°08.7	25.5	282°14.9	33.9	275°58.8	18.8									Pollux	243°22.1	27°58.6			
21	233°23.8	168°49.8	18.2	231°09.8	24.9	297°17.7	34.0	291°01.4	18.8									Avior	234°16.7	-59°34.6			
22	248°26.3	183°51.8	18.1	246°10.9	24.4	312°20.4	34.0	306°04.1	18.9									Suhail	222°49.3	-43°31.0			
23	263°28.7	198°53.8	17.9	261°11.9	23.9	327°23.2	34.1	321°06.7	18.9									Majid	221°39.6	-69°48.2			
Mer.pass.:05.28				v2.1 d-0.1 m-4.5				v2.8 d-0.1 m-2.6				v2.6 d-0.0 m0.2											
Tue	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec														
0	278°31.2	213°55.8	N17°17.8	276°13.0	S20°23.3	342°26.0	S21°34.2	336°09.4	S20°18.7									Alpheratz	357°38.5	27°32.0			
1	293°33.6	228°57.8	17.7	291°14.1	22.8	357°28.8	34.2	351°12.0	19.0									Ankaa	353°10.8	-42°11.5			
2	308°36.1	243°59.7	17.6	305°16.6	22.2	11°24.9	34.3	5°11.4	19.0									Dhedar	349°35.1	56°38.6			
3	323°38.6	259°01.7	17.5	321°16.2	21.7	27°34.3	34.3	21°17.3	19.1									Achernar	335°23.3	-57°07.8			
4	338°41.0	274°03.7	17.4	336°17.2	21.2	42°37.1	34.4	36°19.9	19.1									Hamal	327°55.5	23°33.3			
5	353°43.5	289°05.7	17.3	351°18.3	20.6	57°49.9	34.5	51°22.5	19.1									Polaris	315°58.0	89°20.6			
6	8°46.0	304°07.6	N17°17.2	6°19.4	S20°21.1	72°42.7	S21°34.5	66°26.2	S20°19.2									Alkaid	315°14.9	-40°13.3			
7	23°48.4	319°09.6	17.1	21°20.4	19.5	87°45.5	34.6	81°27.8	19.2									Menkar	314°10.2	4°10.1			
8	38°50.9	334°11.5	17.0	36°21.5	19.0	102°48.2	34.6	96°30.4	19.2									Arcturus	145°51.0	19°05.1			
9	53°53.4	349°13.5	16.9	51°22.6	18.7	117°51.0	34.7	111°33.1	19.3									Rigel	281°07.7	-8°10.8			
10	68°55.8	4°15.5	16.8	66°23.6	17.9	132°53.8	34.7	126°35.7	19.3									Kochab	137°19.3	74°04.7			
11	83°58.3	19°17.4	16.7	81°24.7	17.4	147°56.6	34.8	141°38.3	19.4									Zuben ubi	136°59.8	-16°07.5			
12	99°00.7	34°19.3	N17°16.6	96°25.8	S20°16.9	162°59.4	S21°34.9	156°41.0	S20°18.4									Alphecca	128°06.1	26°39.0			
13	114°03.2	49°21.3	16.5	111°26.8	16.3	178°02.1	34.9	171°43.6	19.4									Antares	112°20.0	-26°28.6			
14	129°05.7	64°23.2	16.4	126°27.9	15.8	193°04.9	35.0	186°46.2	19.5									Atria	107°16.9	-69°03.8			
15	144°08.1	79°25.2	16.3	141°29.0	15.2	208°07.7	35.0	201°48.9	19.5									Sabik	102°06.6	-15°44.9			
16	159°10.6	94°27.1	16.2	156°30.1	14.7	223°10.5	35.1	216°51.5	19.6									Shaula	96°14.9	-37°07.0			
17	174°13.1	109°29.0	16.1	171°31.1	14.2	238°13.3	35.2	231°54.2	19.6									Rasalhague	96°01.6	12°32.9			
18	189°15.5	124°30.9	N17°16.0	186°32.2	S20°13.6	253°16.0	S21°35.2	246°56.8	S20°19.6									Etamin	90°43.3	51°29.3			
19	204°18.0	139°32.9	15.9	201°33.2	13.1	268°18.8	35.3	261°59.4	19.7									Kaus Aust.	83°36.9	-34°22.4			
20	219°20.5	154°34.8	15.8	216°34.3	12.6	283°21.6	35.3	277°02.7	19.7									Vega	80°35.3	38°48.2			
21	234°22.9	169°36.7	15.7	231°35.4	12.0	298°24.4	35.4	292°04.7	19.8									Nunki	75°51.5	-68°16.2			
22	249°25.4	184°38.6	15.6	246°36.5	11.5	313°27.2	35.5	307°07.3	19.8									Altair	62°03.3	8°55.3			
23	264°27.9	199°40.5	15.5	261°37.5	10.9	328°29.9	35.5	322°10.0	19.8									Peacock	53°11.0	-56°40.0			
Mer.pass.:05.25				v2.0 d-0.1 m-4.5				v2.8 d-0.1 m-2.6				v2.6 d-0.0 m0.2											
Wed	GHA	GHA	Dec	GHA	Dec	GHA	Dec	GHA	Dec														
0	279°30.3	214°42.4	N17°15.5	276°38.6	S20°10.4	343°32.7	S21°35.6	337°12.6	S20°19.9									Alpheratz	357°38.5	27°32.0			
1	294°32.8	229°44.3	15.4	291°39.7	9.9	362°35.5	35.6	352°15.2	19.9									Ankaa	353°10.8	-42°11.5			
2	309°35.2	244°46.2	15.3	306°40.7	9.3	13°38.3	35.7	7°17.9	19.9									Dhedar	349°35.1	56°38.6			
3	324°37.7	259°48.1	15.2	321°41.8	8.8	28°41.1	35.7	22°20.5	20.0									Achernar	335°23.3	-57°07.8			
4	339°40.2	274°50.1	15.1	336°43.8	8.3	33°43.9	35.8	27°23.2	20.0									Hamal	327°55.5	23°33.3			
5	354°42.6	289°51.9	15.1	351°43.9	7.7	38°46.6	35.9	32°25.8	20.1									Polaris	315°58.0	89°20.6			
6	9°45.1	304°53.7	N17°15.0	6°45.0	S20°07.2	73°49.4	S21°35.9	67°28.4	S20°20.1									Alkaid	315°14.9	-40°13.3			
7	24°47.6	319°55.6	14.9	21°46.1	6.7	88°52.2	36.0	82°31.1	20.1									Menkar	314°10.2	4°10.1			
8	39°50.0	334°57.5	14.8	36°47.9	6.1	103°55.0	36.0	97°33.7	20.2									Arcturus	145°51.0	19°05.1			
9	54°52.5	349°59.4	14.8	51°48.2	5.6	118°57.8	36.1	112°36.3	20.2									Rigel	281°07.7	-8°10.8			
10	69°55.0	5°01.2	14.7	66°49.3	5.1	134°00.6	36.2	127°39.0	20.3									Kochab	137°19.3	74°04.7			
11	84°57.4	20°03.1	14.6	81°50.3	4.6	149°03.3	36.2	142°41.6	20.3									Zuben ubi	136°59.8	-16°07.5			
12	99°59.9	35°04.9	N17°14.6	96°51.5	S20°04.0	164°06.1	S21°36.1	157°54.3	S20°20.3									Antares	112°20.0	-26°28.6			
13	115°02.4	50°06.8	14.5	111°52.5	4.3	179°08.9	36.3	172°49.9	20.3									Alnair	295°12.1	35°11.4			
14	130°04.8	65°08.7	14.4	126°53.6	4.2	194°11.7	36.4	187°49.5	20.4									Mars	357°14.8	05.35			
15	145°07.1	80°10.4	14.3	141°54.7	4.1	209°14.6	36.5	202°52.2	20.4														

Attachment 4: MSLP Analysis Charts

