SIERRA COLLEGE OBSERVATIONAL ASTRONOMY
LABORATORY EXERCISE

Lab N01: The Night Sky (Spring)

NAME **GROUP**

OBJECTIVE:

- Learn about degree measurements.
- Learn about the Horizon Coordinate System.
- Learn the basics of an All-Sky star chart.
- Learn the basics of a sky simulation program.

INTRODUCTION:

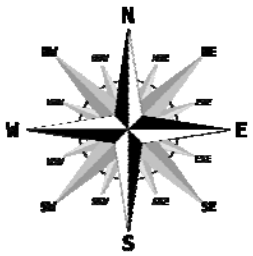
The night sky is mysterious and full of wonders. The stars in the sky are grouped into 88 regions called *constellations*, which commemorate heroes, beasts of legend, etc. Some are indicated on the *All-Sky star chart* in this lab.

To navigate the sky, we must be familiar with the idea of *angular measure*. We will use the common system of *degrees* (there are 360 degrees in a circle). A degree can be divided into 60 subunits called *arcminutes*. An arcminute can be divided into 60 subunits called *arcseconds*. Angular measures can also be expressed in *decimal degrees* (see the sample calculation in this lab).

One way of navigating the sky is by the *Horizon Coordinate System*, which has the two measures called Altitude and Azimuth. *Altitude* measures how many degrees something is above the *horizon line* (the apparent boundary between ground and sky). *Azimuth* measures the number of degrees something is from due north—see the box below, which provides the azimuths of the four *cardinal directions* (N, S, E, W).

Azimuths of the Cardinal Directions

North	East	South	West
0°	90°	180°	270°



Using the terminology of the Horizon Coordinate System, we can note two other important concepts. The *zenith* is the point in the sky at an altitude of 90°, in other words, straight overhead. The *meridian* is the line in the sky that passes from due south, through the zenith, to due north.

PROCEDURE I: Measuring Angular Scales

1. Measure the size of your fist in degrees. Record it here:

   One Fist = _____

2. The instructor has selected two features outside for you to measure using your fist-spans. Record your values in Table A, in both fist-spans and degrees.

Table A: Your Angle measures

Feature	Size in Fists	Size in Degrees
Feature 1)		
Feature 2)		

3. Record the angular size of each object, as measured by each of your group team members, in Table B. Calculate the average of your team's values for both features.

Table B: Team Angle measures

Feature	Member #1	Member #2	Member #3	Average
Feature 1)				
Feature 2)				

PROCEDURE II: Navigating All-Sky star charts

4. The following steps refer to the All-Sky star chart on the last page of this lab. Carefully annotate the chart with following points or features, using a COLORED PEN OR PENCIL. Take care to mark the map neatly and accurately, or you will lose points.

   a) Label the horizon clearly.
   b) Label the zenith point.
   c) Use a ruler to draw in the meridian—from horizon, to zenith, to the opposite horizon. Label it.
   d) Find the point in the sky at azimuth = 90°, altitude = 45°. Label it with the letter A.
   e) Find the point in the sky at azimuth = 0°, altitude = 30°. Label it with the letter B.
   f) Find the star Regulus on the chart. Next to it, clearly and neatly indicate your estimates for its altitude and azimuth (in that order).

PROCEDURE III: The Horizon Coordinate system and the moving sky

5. Using the sky simulation software demonstrated in class, determine the altitudes and azimuths of the following stars for the dates and times specified. Round your values to the nearest degree.

Table C: Altitude and Azimuth in Time

	February 1 at 9 pm		**February 1 at 11 pm**	
	Altitude	**Azimuth**	**Azimuth**	**Altitude**
Sirius				
Capella				
Polaris				

VOCABULARY:

Constellation
All-Sky star chart
Horizon line
Zenith
Meridian
Horizon Coordinate System
Cardinal directions
Azimuth
Altitude
Angular measure
Degrees
Arcminute
Arcsecond
Decimal degrees

Sample calculation:
Converting degrees + arcminutes + arcseconds into decimal degrees

Convert the angular measure of 30° 18’ 23” into decimal degrees.
Recall there are 60” in 1’, and 60’ in 1°.

Step 1: Convert 18’ + 23” into arcminutes: 18’ + (23/60)’ = 18.38’
Step 2: Convert 30° + 18.38’ into degrees: 30° + (18.38/60)° = 30.31°

QUESTIONS/ANALYSIS:

1) Round the angular measure of 41° 28’ 33” to the nearest degree, and also convert it to decimal degrees.

Rounded: _____ Decimal degrees: _____

2) Round the angular measure of 15° 48’ 21” to the nearest degree, and also convert it to decimal degrees.

Rounded: _____ Decimal degrees: _____

3) Referring to the All-Sky star chart, locate the bright, named star that is near the coordinates, Azimuth = 135°, Altitude = 45°. What is the star's name, and what constellation is it in?

Star: _____ Constellation: _____

4) Referring to the All-Sky star chart, locate the bright, named star that is nearest the zenith. What is the star's name, and what constellation is it in?

Star: _____ Constellation: _____

5) Referring to Table C, one star has horizon coordinates (altitude and azimuth) that do not change significantly with time. What is the star's name, and (using the All-Sky chart) what constellation is it in?

Star: _____ Constellation: _____

6) Use the sky simulation software to estimate the Horizon Coordinates for the stars in Table D—note the new time and date.

Table D: Altitude and Azimuth in the Year

	April 1 at 9 pm	
	Altitude	**Azimuth**
Sirius		
Capella		
Polaris		

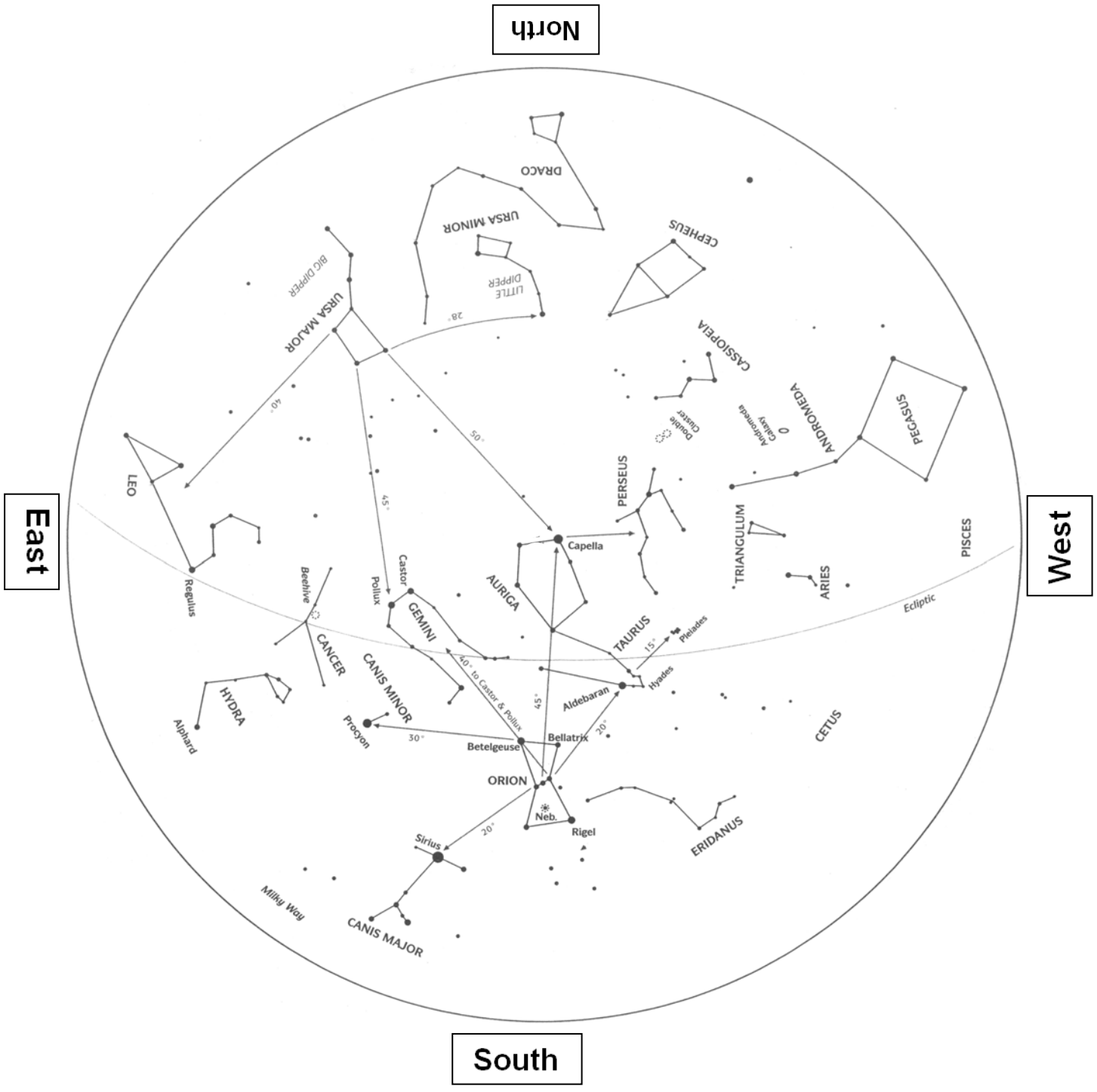
7) Comparing the 9 pm April coordinates in Table D to the 9 pm February coordinates in Table C, one star has horizon coordinates (altitude and azimuth) that do not change significantly with changing days. What is the star's name, and (using the All-Sky chart) what constellation is it in?

Star: _____ Constellation: _____

Homework for next lab:

Write a one sentence definition of each vocabulary term in Lab N02. This is to be handed in at the beginning of the class. Handwritten or emailed homeworks are not accepted—it must be printed out for credit.

Spring Semester



Early January	10 pm—12 am
Late January	9 pm—11 pm
Early February	8 pm—10 pm
Late February	7 pm—9 pm
Early March	6 pm—8 pm

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