SIERRA COLLEGE OBSERVATIONAL ASTRONOMY LABORATORY EXERCISE		
NUMBER I.A. **TITLE: SIZING UP THE SKY (Spring)**		
DATE- DAY- LOCATION	PRINT NAME/S AND INITIAL BELOW:	GROUP

OBJECTIVE:
- Make visual observations of the night sky.
- Make measurements using linear and angular units of measure.
- Learn about map/image scales.
- Analyze relevant sources of measurement error.

DESCRIPTION:

The angular separations of objects in the sky are expressed in units such as degrees. The angular separation of the stars in the Winter Triangle will be estimated using a technique described by the instructor. The linear separation of stars on a map will also be determined to calculate a map scale.

PROCEDURE I: ANGULAR SEPARATIONS IN THE SKY

1. Identify the three stars Betelgeuse, Sirius, and Procyon on the star map provided—print the name of each next to the star. Highlight the boundaries of the constellations that contain these three stars; and label each constellation within its boundaries. Highlight the boundaries of another constellation of your choice, and label it, as well.

2. Using the technique described in class, measure the angular distances subtended by the following parts of your hand. Label your values with degree symbols.

Table A: Hand Measures

Hand-span	Fist	3-Fingers	Pinkie

3. Under the night sky, face south and measure the distances between the three stars of the Winter Triangle, using whatever combination of hand measures works the best. For example, you might find that the distance between two of the stars is nicely spanned by 1 hand-span, 1 fist, and 2 pinkies. Record these measures in your Bluebook and in Table B.

Table B: Angular Separations

Distance to be measured	Separation (in fists, pinkies, etc.)
Betelgeuse to Sirius	
Sirius to Procyon	
Procyon to Betelgeuse	

4. Convert your measures from Table B into degrees, and record your results in Table C. To complete Table C, use TheSky to determine the accurate separations between the stars (in degrees, arcminutes, and arcseconds). Convert these values into decimal degrees and also round them to the nearest degree. Finally, calculate the discrepancy of your measured results, compared to the rounded values from TheSky.

Table C: Distance Calculations

Distance measured	Measured separation	Separation (from TheSky)	Decimal degrees	Degrees (rounded)	Discrepancy (yours vs. rounded)
Betelgeuse to Sirius					
Sirius to Procyon					
Procyon to Betelgeuse					

PROCEDURE II: MAP SCALES

5. Transfer your values for decimal degrees from Table C to Table D. Also, carefully use a ruler to measure the linear distances (in mm) between the three stars, shown on the star chart in this lab. Record these distances in Table D.

6. Calculate three estimates of the map scale of your star chart. Finish by calculating the average of your three estimates for the map scale. Do not forget to include correct units when you complete this table.

Table D: Map Scale

Distance	Decimal degrees	Linear distances on star chart	Map scale
Betelgeuse to Sirius			
Sirius to Procyon			
Procyon to Betelgeuse			
		Average map scale:	

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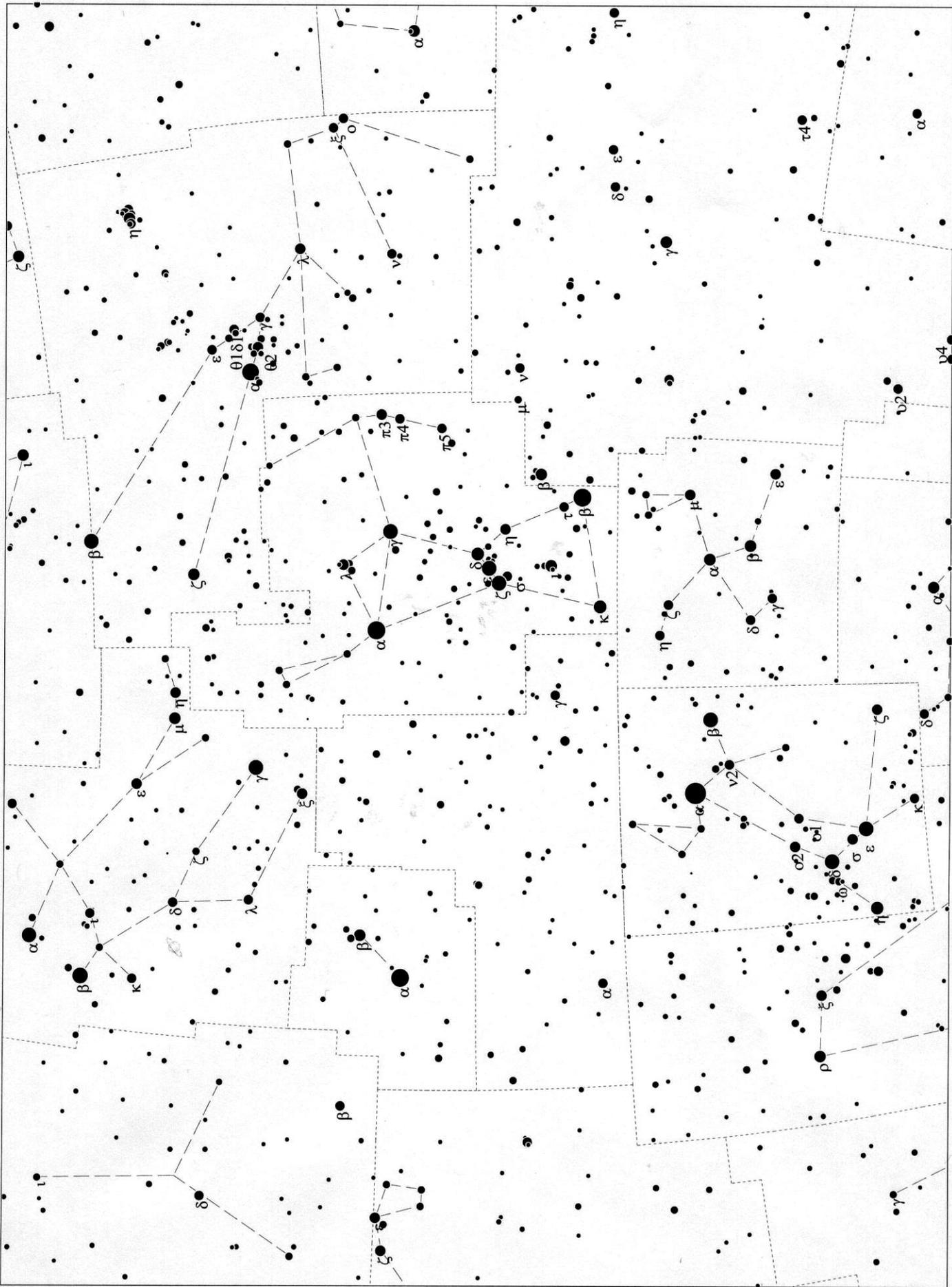
7. Examine the large Moon map and have your team measure the diameter (in mm) of the image of crater Copernicus three times (each person could measure the crater once). Compute the average of these three values. Record your information in Table E.

Table E: Moon Map Scales I

Crater	Size measurements			Average
Copernicus				

8. Find the given scale factor at the bottom of the map. Calculate the actual size of Copernicus on the Moon in mm and km. Compared to the reference value of the crater, determine the discrepancy of your computed size. Record your information in Table F.

Table F: Moon Map Scales II

Scale Factor	Actual size (mm)	Actual size (km)	Reference size	Discrepancy
1:			93 km	

QUESTIONS/ANALYSIS:

1.   List the types of error described by the instructor.

    _____   _____   _____

2.   In Table D, was the map scale the same on all three sides of the Winter Triangle? If not, why do you suppose there were differences? (In other words, what were your sources of error?)

3.   Using the average map scale you determined in Table D, and the star chart in this lab, calculate the angular separation between Pollux and Rigel. Show your work. (Do not use TheSky to find this angular separation!)

4.   What might be reasons your estimate for the size of Copernicus in Table F is different from the reference size.