

<b>SIERRA COLLEGE OBSERVATIONAL ASTRONOMY LABORATORY EXERCISE</b>		
<b>NUMBER I.A.</b>	<b>TITLE: SIZING UP THE SKY (Summer)</b>	
<b>DATE-</b>	<b>PRINT NAME/S AND INITIAL BELOW:</b>	<b>GROUP</b> <input style="width: 40px; height: 20px;" type="text"/>
<b>DAY-</b>		
<b>LOCATION</b>		

**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 three stars in the sky 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 Antares, Spica, and Arcturus 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. (Note: The instructor may substitute Regulus for Antares.)
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, 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.)
Antares (or Regulus) to Spica	
Spica to Arcturus	
Arcturus to Antares (or Regulus)	

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**

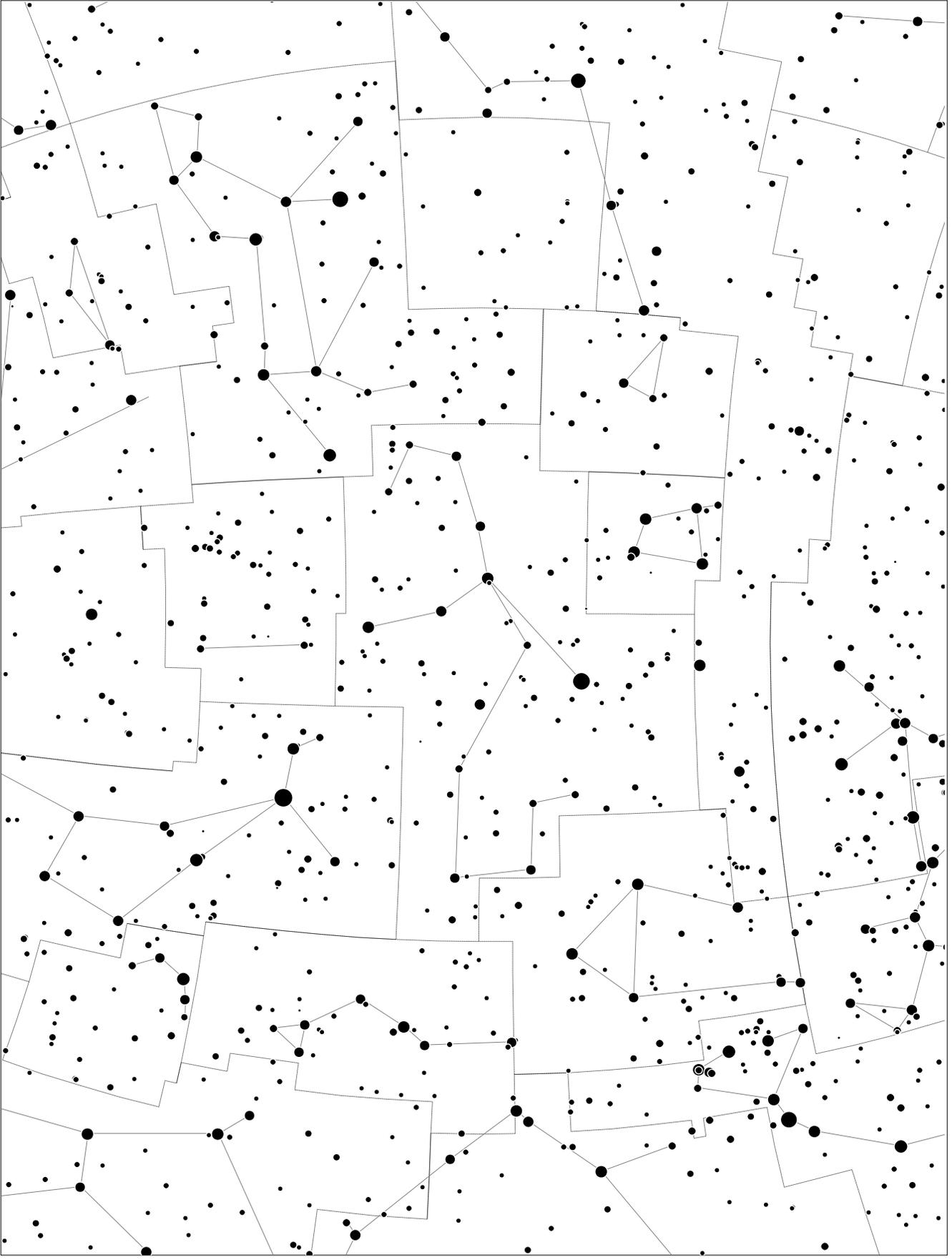
Distance measured	Measured separation	Separation (from TheSky)	Decimal degrees	Degrees (rounded)	Discrepancy (yours vs. rounded)
Antares (or Regulus) to Spica					
Spica to Arcturus					
Arcturus to Antares (or Regulus)					

**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
Antares (or Regulus) to Spica			
Spica to Arcturus			
Arcturus to Antares (or Regulus)			
			Average map scale:



- 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				

- 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:**

- List the types of error described by the instructor.  
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- In Table D, was the map scale the same for all three star separations? If not, why do you suppose there were differences? (In other words, what were your sources of error?)
- Using the average map scale you determined in Table D, and the star chart in this lab, calculate the angular separation between Denebola and Alphecca. Show your work. (Do not use TheSky to find this angular separation!)
- What might be reasons your estimate for the size of Copernicus in Table F is different from the reference size.