

Lab 1. Measuring Angles

Equipment

- 1m Ruler; small Ruler; Body Parts
- Toolkit
- Optional: Show them instruments to measure angles, like a Cross-Staff, a Starlabe, a Sextant, etc

Mini Lecture prior to Lab

- Explain to the students why we use angles in astronomy
- Explain how the angular size of an object depends on the distance of the object (they all know it yet many of them never thought about that concept)
- Introduce Toolkit and sections on angles & review basic trigonometry (optional)
- Review significant figures and Scientific Notation
- Mention the “one-finger-rule” and make students test it in class.

Procedure and Lab Setup

- This lab can be done anywhere.
- In the first part the students measure the width of their fingers and the length of their arm with the aim of testing the hypothesis that “a finger held at arms length corresponds to 1 degree). Following that they analyze the correlation between angular, linear size, and distance. Part I typically takes about one hour.
- In Part II they test the 1-degree-per-finger rule. (~15min)
- In Part III they measure the distances between various stars using their fist and finger. (~15min)

Notes & Suggestions

- This lab can be shortened considerably. Parts II and III are relatively fast to do and can equally well be assigned as a homework.
- If you intend to do part II, please start the lab with that, then do Part I and have the students complete part II afterwards. Have the students go outside and have them measure either the altitude of the Sun (Option I) or the position of the Sun or a bright star (Option II). [The 10-minute-rule for sunsets is cute (they remember it better if you say that it is a good method to impress a date...)]
- Part III is very easy, but it’s a good illustration of how to measure angles with body parts – and it is rather appropriate for an astronomy lab.

General Concepts & What students might get out of this Lab

- Realizing that separations between objects in the sky are measured in angles
- How to use body parts to measure angles (also refer to toolkit)
- How to calculate distance (or size) from angular size if linear size (or distance) is known

Scientific Methodologies

- How to estimate errors
- How to present data in the form of a graph
- How to use words to describe relationships (which then lead to a formula)