Name(s): _____ _____

_____ _____

Date: _____ Course/Section: _____

Grade: _____

Angular Size

Objectives:

The goal of this lab is understand how an object's distance, physical size, and angular size relate to one another, and to learn how astronomers use this relationship to determine the sizes of distant objects.

Checklist:

- ☐ **Complete the pre-lab quiz with your team (if required).**
- ☐ **Compile a list of resources you expect to use in the lab.**
- ☐ **Work with your team to complete the lab exercises and activities.**
- ☐ **Record your results and mark which resources you used.**
- ☐ **Share and discuss your results with the rest of the class.**
- ☐ **Determine if your team's answers are reasonable.**
- ☐ **Submit an observation request for next week (if required).**

Resources:

Pre-Lab Quiz

Record your group's answers to each question, along with your reasoning. These concepts will be relevant later in this lab exercise.

1.
2.
3.
4.

Part 1: Calculating an Angle

1. Calculate the apparent angular size of the building shown in the lab if it is 50 feet tall and you are 30 feet away from it. Show your work.

2. Pick a small angle (<10°) and show that the tangent of a small angle is roughly equal to the angle (in radians).

3. Determine the angular size of an object in the lab. Explain your procedure in detail. Can you use the small angle formula? Does the angular size of the object depend on where you stand?

Part 2: Angular Measurement Tool

1. Describe the angular size measurement tool your group will construct. Draw a diagram in the space provided that shows how your device will be used to make a measurement of the angular size of a distant object. Be sure to label important features, distances and angles in your diagram. Explain how the device is used.

Estimate the precision of your angular size measurement device:

2. Test the accuracy of your angular size measurement device by using it to find the height of one of your group members. Enter your data in the table below.

D = Distance (meters)	
θ = Angular Height (degrees)	
d = Calculated Height (meters)	
Actual Height (meters)	

3. How accurate was your test measurement? Describe any limitations or flaws in the tool you have made. How could you change the way you use or calibrate the device to improve its accuracy?

Part 3: Measuring the Old Capitol Dome

In this part of the lab, you will go to the roof of Van Allen Hall with your instructor and use your angular size measurement device to determine the angular size of the dome of the Old Capitol Building.

1. Describe the method you used to find the distance from the roof of Van Allen Hall to the Old Capitol Building Dome.

2. Enter the data from your measurements and calculations in the table below.

D = Distance from roof of Van Allen Hall to Old Capitol Building (meters)	
θ = Angular Size of Old Capitol Building Dome (degrees)	
d = Calculated Size of Old Capitol Building Dome (meters)	
Actual Size given to you by instructor (meters)	

3. Based on the precision you estimated in Part 2, what are the maximum and minimum values you could have found for the size of the dome? Does the actual size fall within these values? If not, what do you think is the source of the error?