**Parallax in the Classroom- Lab Data Sheet**

Follow the instructions given in the “Parallax in the Classroom” lab handout. Record all data below and answer the analysis questions.

1. Sketch the meter stick and the two strings forming an angle in the space below. Label the following: **angle of** **parallax**, **adjacent** **side** (or distance from angle to stick), **opposite** **side** (or baseline)
2. What do you think happens to the angle of parallax when the angle is formed closer to the stick? Farther away from the stick? Why?
3. If you know the angle of parallax and the baseline (opposite side), what formula can you use to calculate the **distance** (between the angle and the stick)?

\*Use a control angle (180°) in addition to the three angles that you measure. Be sure to calculate the distance using SOHCAHTOA.

|  |  |  |  |
| --- | --- | --- | --- |
| **Angle α of parallax** | **Distance measured (cm)** | **Distance calculated (cm)** | **Baseline (cm)** |
|  |  |  | 50 |
|  |  |  | 50 |
|  |  |  | 50 |
| 180° |  |  | 50 |

Now use your data and make a graph (on the last page) of the angle of parallax versus its distance from the meterstick. (Don’t divide the parallax angle by 2 for this part). Plot parallax angle on the x axis and distance (cm) on the y axis.

1. What is the *independent* *variable* in this lab? How do you know this?
2. What is the *dependent* *variable* in this lab? Explain how you know this.
3. Look at the diagram below showing stellar parallax. How is YOUR experiment (using a meterstick and string) analogous to this diagram?



Because stars are SO far away, their **parallaxes** are most conveniently measured in **seconds of arc** (arc seconds), NOT degrees. The angular size of your thumb held at arm’s length is about 1 degree. Imagine dividing your thumb vertically into 3600 slices. One of these slices would represent the size of an arc second! So therefore ACTUAL STELLAR PARALLAXES ARE VERY SMALL (unlike the angles used in your lab).

To measure the parallaxes of stars and thus calculate their distances, we use a **baseline** of the diameter of the Earth's orbit (actually, one-half of this distance or 1 Astronomical Unit). **Distance** is typically measured in parsecs (1pc = 3.26 light years). So, if we can measure the parallax angle, we know that ***the distance to the object is proportional to the inverse of that angle.***

1. ` Calculate the distances to the following stars:

|  |  |  |
| --- | --- | --- |
| Star Name | Parallax (arc seconds) | Distance (parsecs) |
| Arcturus (alpha Bootes) | 0.090 |  |
| Procyon (alpha Canis Minoris) | 0.288 |  |
| Hadar (beta Centauri) | 0.0062 |  |
| Rigel (beta Orionis) | 0.0042 |  |
| Sirius (alpha Canis Majoris) | 0.379 |  |
| Altair (alpha Aurigae) | 0.194 |  |

1. Suppose at your telescope you measure the parallax of the star Regulus to be one-half of the parallax of the star Denebola. What do you immediately know about their relative distances from us? (Hint: compare Sirius and Altair in the table just above.)
2. That Regulus and Denebola are approximately the same distance from Earth.
3. That Regulus is about half the distance from us that Denebola is.
4. That Regulus is twice the distance from us.
5. That Regulus is 8 light years away, and we cannot determine the distance to Denebola.
6. What does your graph below tell you about parallax angle and distance?
7. Can you ever get the angle of your string to be 0? Why/why not?