Example Data Table

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Location: Temple City, California

D1=D2: 5 Inches

D: 5 inches

H: 61.25 inches

smallest z1: 38.51 degrees

smallest z2:

A = z2 – z1 =

R = 180*D/(A*pi) =

Time	S	X1	L=S+X1-D	tan(z)=L/H	z = ATAN(L/H)
12:30	50.80 Inches	5 Inches	50.80+5-5= 50.80 Inches	tan(z)= 50.80/61.25	39.67 degrees
12:35	50.50 Inches	5 Inches	50.50+5-5= 50.50 Inches	tan(z)= 50.50/61.25	39.51 degrees
12:40	50.00 Inches	5 Inches	50+5-5= 50.00 Inches	tan(z)= 50/61.25	39.23 degrees
12:45	49.75 Inches	5 Inches	49.75+5-5= 49.75 Inches	tan(z)= 49.75/61.25	39.09 degrees

12:50	49.30 Inches	5 Inches	49.30+5-5= 49.30 Inches	tan(z)= 49.30/61.25	38.83 degrees
13:00	49.00 Inches	5 Inches	49.00+5-5= 49.00 Inches	tan(z)= 49/61.25	38.66 degrees
13:03 (Solar Noon)	48.75 Inches	5 Inches	48.75+5-5= 48.75 Inches	tan(z)= 48.75/61.25	38.51 degrees
13:05	49.00 Inches	5 Inches	49.00+5-5= 49.00 Inches	tan(z)= 49/61.25	38.66 degrees
13:10	49.25 Inches	5 Inches	49.25+5-5= 49.25 Inches	tan(z)= 49.25/61.25	38.80 degrees
13:15	49.40 Inches	5 Inches	49.40+5-5= 49.40 Inches	tan(z)= 49.40/61.25	38.89 degrees

This table also works well in a spread sheet.

Analysis

1)   Fill in the data table with your measured zenith angles, z.

2)   This is your P1 contribution to the class's data set. Send your data table as an email attachment to the instructor. Include the names of everyone who assisted in the measurement. He/she will post your results on the ASTR360 Lecture Notes page.

3)   If a group travels far enough away from CSULA on the shadow measurement day their data can be used as the P2 site. The distant site must be at least 100 miles away on a true north south line. This is the distance on a fixed

longitude between latitudes. Going even 1000 miles east-west at the same latitude is not useable.

4)   The instructor will supply the zenith angles at Sacramento as a P2 site. No site in Southern California is a valid P2 site. The true N-S distance from the Southern California sites will be listed on the web link with the USNO zenith angle predictions.

5)   The P1 sites are your class mates results. **Look at every data set that was submitted. You judge whether or not the data are reliable.** State your criteria. You can not use the known radius of the earth as a criterion for selecting a data set.

6)   Reliable data will show the shadow lengths decreasing until solar noon and then increasing after solar noon.

7)   Find the radius of the earth for each reliable pair of P1-P2 and take the average to report the radius of the earth. This is the best determination from our data sets.

8)   Everyone must turn in a report doing the analysis even if you were not able to assist in the data measurement. Include a short narrative in the report describing the experimental difficulties, if any, in making the measurements. Can you suggest improvements in procedures.

9)   Make a plot of a good data set you choose showing the zenith angle on the vertical axis and the time of day on the horizontal axis. A spread sheet plot is acceptable.

10) Everyone whose name appears on the posted data tables submitted for the whole class's use will receive at least 10 points out of the 20 points assigned to the report.

11) For 25% extra credit use the data to determine the height of the sun above a flat earth model. In order to get full credit for this the answer must be right. Use any resource you can find to determine the height. There will not be partial credit for extra credit. The answer is either right or wrong.