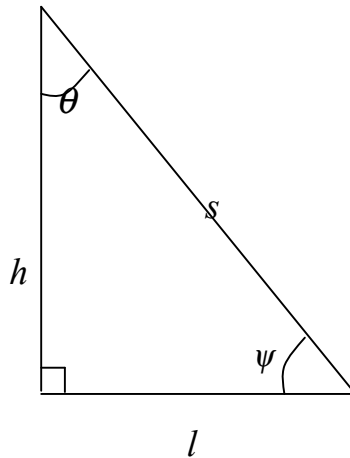


**Class Project Hints**  
**Physics 5 – F. H. Shu – Fall 2007**

To do the class projects on the Sun and the Moon, you will need to measure angles and to know the relationship between angles and right triangles. The following diagram yields a review of the needed trigonometric relationships.



$$\tan \psi = \frac{h}{l}, \quad \sin \psi = \frac{h}{s}, \quad \psi = 90^\circ - \theta$$

Examples:

1)  $H$  = your height,  $L$  = measured horizontal length of your shadow at noon.

Then you can calculate the height of a structure (e.g., lamp post) of unknown height  $h$  by measuring the length  $l$  of its horizontal shadow at noon, and setting

$$\frac{h}{l} = \frac{H}{L} \quad \Rightarrow \quad h = \frac{H}{L} l.$$

Knowing  $h$ , which is fixed for the duration of the experiment, you can compute the elevation angle  $\psi$  of the Sun throughout the term by measuring  $l$  on noon of different days and using the formula  $\tan \psi = h / l$ .

2)  $h$  = vertical length of string with a weight at its end, measured from the point as you sight along  $s$  toward Polaris (or the Moon) from your eye placed at the point of intersection of  $l$  and  $s$ . If a friend measures the lengths  $h$  and  $l$  (or  $s$ ), you can compute the elevation angle  $\psi$  of Polaris (or the Moon) from the formula  $\tan \psi = h / l$  or from  $\sin \psi = h / s$ .

Alternatively, you can try to measure  $\theta$  as an angle and compute  $\psi$  from  $\theta$ .