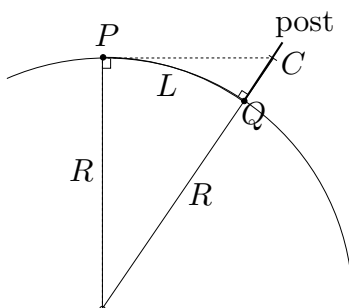


Additional problem related to material about the time of worksheet 2.

If a surveyor measures differences in elevation when making plans for a highway across a desert, corrections must be made for the curvature of the Earth. Suppose a surveyor, located at the point P in the figure below, looks horizontally through his scope at a (vertical) post held by an assistant located at the point Q , with exactly the same elevation as P . The post has markings on it indicating the height on the post. In this example, P and Q having the same elevation means that they have the same distance to the center of the earth. Then the surveyor will not see the bottom of the post, but instead observes a height C on the post. If the assistant were standing at a point of lower or higher elevation, then the surveyor must subtract C from any reading he obtains on the post.



- (a) If R is the radius of the Earth and L is the length of the highway, show that the correction is

$$C = R \sec(L/R) - R.$$

- (b) Use a Taylor polynomial to show that

$$C \approx \frac{L^2}{2R} + \frac{5L^4}{24R^3}.$$

- (c) Compare the corrections given by the formulas in parts (a) and (b) for a highway that is 100 km long. (Take the radius of the Earth to be 6370 km.)