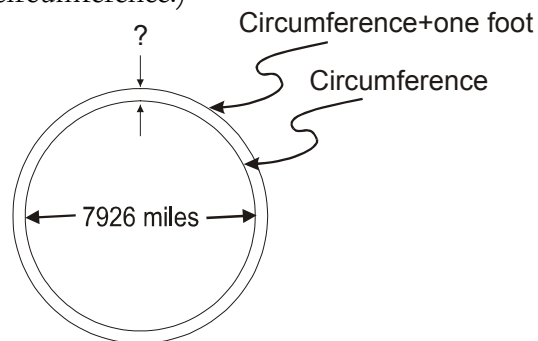


The Effects of Inaccurate Data

This assignment is designed to cause you to consider the effects that inaccurate data can have on the solution of a problem.

Almost all real world problems have input data that are subject to error. The source of the error may be a difficulty in measurement, a poor model, or simply mistyping an entry. One hopes that small errors in inputs lead to small errors in outputs (i.e. the solutions to problems) but there is no guarantee that this will happen. Sometimes very small input errors can lead to huge output errors.

1. As a simple situation, consider that a belt is to be made about the equator of the earth. You may take the earth's diameter as 7,926 miles. The belt is one foot too large for the equator. In order to make the belt fit, you will put some sand underneath it at an equal height all around the equator. How deep in inches should the sand be? (You made an error of one foot in measuring the circumference. Your problem is to see how that affects the radius of the actual sphere that has this larger value as its circumference.)



2. This one is trickier. Imagine that we are installing rails for a high speed railroad. One of the rails needs to be replaced. The gap that remains after the old rail is removed is 100 meters. (These rails are quite long to accommodate the smoothness required by the high speed train.) The company that makes the rails is able to guarantee the length to a 1 cm. tolerance. On the low side, if the rail is 99.99 meters then there will obviously be a 1 cm gap between the rails (In fact, they would center the rail so that there is a .5 cm. gaps at each end.) This is tolerable. On the high side however, the rail is 100.01 meters long and it will bow up into a circular arc above the 100 meter gap. Your problem is to determine the maximum height of the resulting bow. (This problem is not easy. Take it as far as you can. It would be nice if you could determine the maximum height as asked but, if you can only reduce it to some equations, do that much. For this problem I will allow co-working.)

