

## Advanced Challenge Level 2 Problem #2

---

The precalculus class of Colebrook Academy was given a special project. The students had to determine the elevation of Monadnock Mountain relative to the soccer field. After much discussion, they came up with an idea. They would need a sophisticated device for measuring angles and a tape measure 300 feet long. They planned to meet at the ball field on a Saturday morning (so they didn't miss any classes) to make their measurements. They did this, and this is what they found.

They started from a point on the eastern edge of the field and measured the angle of elevation to the top of the mountain. The angle, labeled  $a$  below, measured 8.146 degrees. Then they walked in a straight line toward the mountain peak a distance of precisely 300 feet, labeled as  $x$  below. They measured the angle of elevation to the top of the mountain again from this new position. This time the angle, labeled  $b$  below, measured 8.318 degrees. From these measurements, they were able to accurately determine the elevation of the mountain relative to the ball field, labeled  $h$  below.

You have to do each of the following.

1. Derive a relationship that gives  $h$  in terms of  $a$ ,  $b$ , and  $x$ .
2. Use your relationship to estimate the value of  $h$ .

This diagram is not drawn to scale.

