The height of the first hill of a roller coaster is very important. Roller coasters use the acceleration due to gravity to complete its course. Thus, the height of the beginning of the coaster determines the energy and therefore the kinetic energy and of the roller coaster. Thus, the height of the Cannibal tower is critical to rest of the ride!

Height of Cannibal track as it exits the tower \( h_{\text{track}} \): 63 m (208 ft)

Questions

1. Fill in the blanks of the above statement.
   a. ____________  b. ____________.

2. Stand in a location where you can see the track exit the tower.
   a. Measure the angle \( \theta_{\text{track}} \) from where you are to the point the track exits the top of the tower using the iPhone or iPod “Multi Protractor” or Android “Advanced Protractor” application (see page 13).

   \[ \theta_{\text{track}} = \text{__________} \text{ degrees} \]

   b. Calculate the distance \( d_{\text{calc}} \) from the base of the Cannibal tower to where you are standing, using \( \theta_{\text{track}} \), the trig functions below (determine which function is relevant), and the \( h_{\text{track}} \), given above.

   \[ d_{\text{calc}} = \text{__________} \text{ m} \]

   c. Measure the angle \( \theta_{\text{tower}} \) from where you are to the top of the tower.

   \[ \theta_{\text{tower}} = \text{__________} \text{ degrees} \]

   d. Using angle \( \theta_{\text{tower}} \), the distance \( d_{\text{calc}} \) and the trig functions, calculate the height \( h_{\text{tower}} \) of the Cannibal track at the top of the tower.

   \[ h_{\text{tower}} = \text{__________} \text{ m} \]

   e. Good scientists always check their work. Pace the distance, \( d_{\text{meas}} \), from your measurement point to the base of Cannibal tower. How well does this agree with your value from (b)?

   \[ d_{\text{meas}} = \text{__________} \text{ m} \]

   \[ \text{percent difference} = \frac{d_{\text{meas}} - d_{\text{calc}}}{\frac{1}{2}(d_{\text{meas}} + d_{\text{calc}})} \times 100 = \text{__________} \% \]