

# HEIGHTS

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

- Fill in the blanks of the above statement.
  - \_\_\_\_\_
  - \_\_\_\_\_
- Stand in a location where you can see the track exit the tower.
  - 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).

$$\theta_{\text{track}} = \text{_____ degrees}$$

- 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.

$$d_{\text{calc}} = \text{_____ m}$$

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

$$\theta_{\text{tower}} = \text{_____ degrees}$$

- 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.

$$h_{\text{tower}} = \text{_____ m}$$

- 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)?

$$d_{\text{meas}} = \text{_____ m}$$

$$\text{percent difference} = \frac{d_{\text{meas}} - d_{\text{calc}}}{\frac{1}{2}(d_{\text{meas}} + d_{\text{calc}})} * 100 = \text{_____ \%}$$

