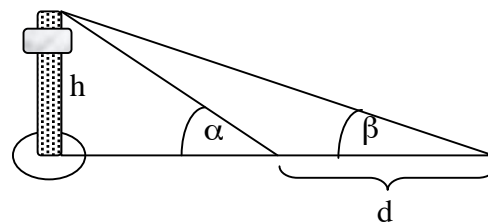# PRECALCULUS AT GREAT AMERICA

Trig Application: Indirect Height Calculations

(1) Develop a formula for finding height "h" of
a park landmark (*e.g.,* Star Tower) using
two known angles taken "d" distance apart
along a horizontal line extending from the
base of the landmark.

(2) Use indirect measurement as diagrammed at
right to calculate the height of two
landmarks in the park.
Include the name of the landmark, the portion of the structure for which you are finding
height, your data and your calculations. Explain how you determined the distance "d,"
and include appropriate units with your calculations and answers.

Dual-Axis Rides: Angular and Linear Velocities

Observe one of the dual-axis rides where riders are
positioned on a small circular platform mounted on a
larger circular base. When the ride is in motion, both
platforms revolve. On the illustration, indicate the
direction of rotation for each circular platform, and
estimate the distances from centers to rider on the small
platform between centers of the two platforms.
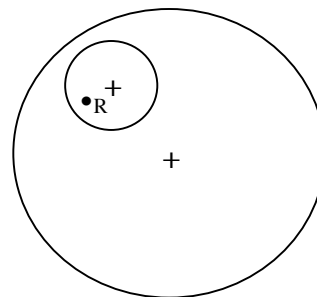
(1) When the ride is at full speed, how long does it take for each platform to make one
revolution about its center?

(2) Illustrate the position of the rider with respect to both platforms at the time when the
rider's velocity is (a) the sum of same-direction velocities; (b) a sum of opposite-
direction velocities; and (c) a right-triangle composition of velocities.

(3) Calculate the angular and linear speeds of the rider at each position (2a), (2b) and (2c),
above.

Free-Fall Distance, Velocity & Acceleration

Observe a ride in which the rider experiences vertical free-fall.
(1) Collect data or determine measures related to free-fall.
    a. Time the free-fall portion of the ride.
    b. Determine the maximum height of the rider's cabin and the vertical distance of
free-fall using indirect measurement techniques.
    c. Use your vertical distance result to calculate time of free-fall.
    d. Compare answers in parts (1a) and (1c). Explain which answer you believe to be
more nearly accurate and why.

(2) Determine the maximum vertical velocity of the rider in free-fall.

(3) If a park worker participating in pre-opening day testing tossed a water balloon horizontally outward at a speed of 10 ft/sec from the very top of the ride at the very moment the worker's cabin began its descent, how far from the base of the ride would the water balloon land?