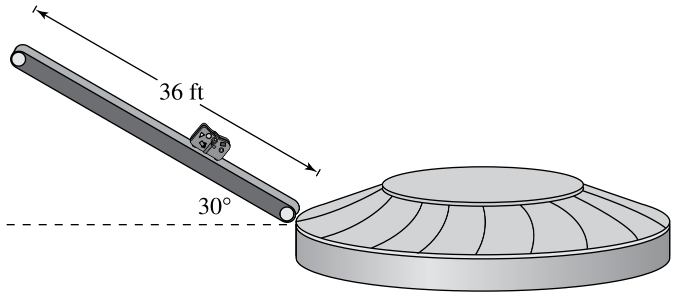
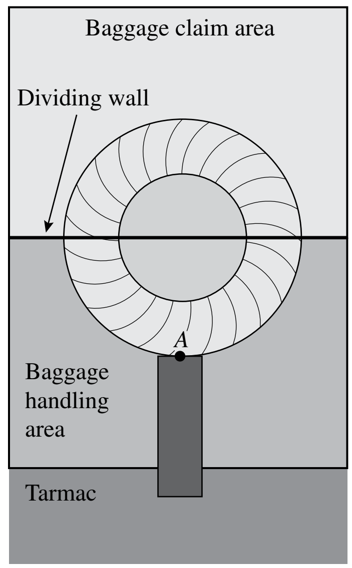
## Collaborative Project – Trigonometry

**The figure shows how luggage travels down a 36-foot ramp from an airport tarmac to a circular carousel that conveys luggage through a baggage claim area.**




**1.** Find the vertical distance that the luggage moves down the ramp.

**The carousel makes 2 clockwise revolutions every 3 minutes. The diameter of the carousel is 40 feet. A wall through the center of the carousel separates the baggage claim area from the baggage handling area.**




**2.** Find the number of revolutions the carousel makes per minute.

**3.** Find the angular speed of the carousel in radians per minute and degrees per second.

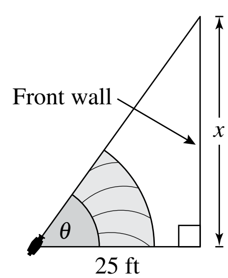
**4.** A bag enters the conveyor at point $A$ at time $t = 0$ ($t$ in seconds). As the conveyor revolves, the bag's position $P$ (in feet) relative to its distance from the dividing wall is periodic. Write a function that models $P(t)$, where the negative values of $P$ are in the baggage handling area. Identify the amplitude and period of $P$. Sketch the graph of $P$. (Include two full two periods.)

**5.** How far from the wall is the bag after 25 seconds, 60 seconds, and 80 seconds? During which of these times is the bag in the baggage claim area?

**6.** Describe the first full interval of time in which the bag will be in the baggage claim area.

**7.** At what time $t$ will the unclaimed bag re-enter the baggage claim area for the *second* time?

**A security camera is mounted on the dividing wall at the center of the carousel, 25 feet from the front wall. The camera pans the front wall, at an angle of $\theta$ with the dividing wall.**




**8.** Find $x$ when $\theta = 22°$.

**9.** Write $\theta$ as a function of $x$. Then find $\theta$ when $x = 25$ feet and when $x = 40$ feet.